MERCURY MEASURING IN EDUCATIONAL, HEALTH, DENTISTRY AND ARTISANAL & SMALL SCALE MINING IN TANZANIA

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND INFORMATION

Mercury is a heavy metal occurring naturally and it is the only metal which is liquid at room temperature. It generally causes harmful effects to body systems: nervous, digestive, and respiratory (lung damage), immunity and urinary systems; neurological problems; DNA and chromosomal damage; allergic reactions and negative reproductive effects. Although it has all these effects to human body, mercury is still used in Tanzania in different ways in direct way and also in some instrument.

AGENDA *for Environment and Responsible Development* (AGENDA) has been implementing a number of activities on minimizing and eliminating mercury use in different sectors in Tanzania. These activities include projects on artisanal and small scale gold mining in Tanzania which included conducting scoping exercise to analyze the extent of use and impacts of mercury pollution from artisanal gold mining activities, identifying sources of mercury (both legal and illegal), current practices/technologies that are used for gold extraction activities, alternative technologies available elsewhere in the world, quantifying the potential impacts of mercury in hot spots areas by taking and analysing samples of water, soil, sediments, fish, vegetables. The activities have also involved assessing potential health impacts, the level of awareness and training needs by artisanal gold miners and surrounding communities, and establishing role and efficacy of the Industrial and Consumer Chemicals Act (2004) in managing mercury use in Tanzania. Also another project was mercury in schools and hospitals which was done to assess the level of awareness in schools and hospitals regarding uses and impacts of mercury.

In its previous studies, AGENDA realised that there is so much to do in minimising mercury release and exposure, as mercury is still in use in different sectors in Tanzania while Governments of the world including Tanzanian government have concluded the negotiations for the mercury treaty to control production and use of mercury. The

Minamata mercury treaty was finalized in January 2013 and the treaty was adopted in October of 2013 at a diplomatic conference in Japan. Hence, AGENDA is complementing government efforts by conducting a study of mercury measurements in the air within educational, health and artisanal and small scale mining centres in Tanzania.

1.2 Purpose of the study

The project objective was to analyse mercury level within education, healthcare, dentistry, and artisanal and small scale mining centres in order to expand the awareness that was created during the previous implemented projects; and also to build capacity to the teachers, healthcare workers, dental personnel, artisanal miners on levels of exposures in their midst as a result of using mercury containing products and equipment. The information gathered by the study would be used for advocacy that is planned to be carried out in 2013 and beyond into pushing the government to take serious efforts in phasing out mercury use in education, healthcare as well as artisanal and small scale gold mining activities.

CHAPTER 2: METHODOLOGY OF THE STUDY

2.1 INTRODUCTION

This section covers the methodology used in conducting the project. It explains what the study entailed and approaches used scope of work, and the tools used for the study.

2.2 SCOPE OF THE WORK

AGENDA implemented the project of mercury measurements in educational, health and artisanal and small scale mining centres in four regions of Tanzania namely Dar-es-salaam, Mbeya, Mwanza and Geita regions. Basically, the project involved measuring mercury level in the air by using a mass spectrometer/ mercury analyser (Lumex RA 915) within education, healthcare (including dental clinics and hospitals); artisanal and small scale mining centres; Industrial and dump sites; and community gathering places. The project covered information on:

I. General level of mercury in the air on different sites; and
II. General awareness level of different stakeholders

2.3 INITIAL WORK

2.3.1. Literature Review

Literature review involved studies, reports from different authors including AGENDA previous reports.

2.3.2. Selecting Team for Field Work

Fieldwork involved a number of staff working at AGENDA. The field work team had been involved in various field surveys and have experience in mercury related projects and have education and professional background in environmental management and planning, environmental assessment, chemical engineering, environmental engineering and socio-economic analysis.

2.3.3. Tools

Main tools that have been used during implementation of the project include a questionnaire, sites specific information, weather conditions and measurement recording form that was designed by ZMWG and edited by AGENDA to suit our situation

2.4 FIELD WORK

The following activities were executed during the fieldwork so as to meet the purpose of the project: -

2.4.1 Conduct mercury level measurements in target areas.

Mercury measurement in air was carried out in different sites. The targeted sites were industrial areas, dump sites, gathering area, health care with dental clinics and in mining sites and centres. Mercury levels in the air were measured in three different cities as follow:-

I. **Dar-es-salaam city:** mercury level in the air measurements were conducted in 1 school, 2 dumping sites, 2 industrial areas, 2 gathering areas, 4 hospitals and 3 dental clinics. In the school, measurements were taken in physics, biology and chemistry laboratory, science equipment and chemicals reagents stores, general classroom and dumpsites. As most of the schools have classes that have wire-meshed windows, we therefore considered them as open and hence ambient temperatures ranged between 28^{o}C and 31^{o}C. Measuring equipment was held at 1m above the floor or land either on a wooden table or chair and sometime was held by hands. In dumping sites, gathering areas and industrial sites, measurements were taken in different locations within individual sites while during measurements, the Lumex machine was held 1m above the soil while the ambient temperature ranged between 29^{o}C and 33^{o}C. In addition to that, in hospitals, measurements were taken in dental sections, wards, dumping sites, stores and in general surroundings. Moreover, in dental clinics and sections,

measurements had been taken before amalgam filling, during and after the dental filling process. Measurements in dental sections depended on the operating condition of the dental section as some of the measurements were done when windows were closed with air condition working (mostly in private dental centres) while temperatures within dental rooms ranged between 22^{o}C and 26^{o}C. In government owned dental hospitals, measurements were carried out while windows were open and temperature ranged between 28^{o}C and 32^{o}C. measurements in wards was carried out in open windows conditions with temperatures ranging between 28^{o}C and 31^{o}C while in medical stores were carried out in closed windows conditions with temperature ranging between 26^{o}C and 33^{o}C. During the measurements' recording in dental sections, wards, stores, open areas and general areas, the Lumex machine was hand held at the height of 1m and above.

Fig. 2.1. Mercury level measurement in the gathering areas in Dar es Salaam city

II. **Mwanza city:** Measurements had been carried out in 1 industrial area, 1 dumping site, 1 school, 1 gathering area, 4 health centres/hospitals, 2 dental clinics which are located in Mwanza city. In all these sites, measurement procedures followed the similar procedures that were used in Dar es Salaam city.

III. **Geita region:** Measurements had been carried out in 7 small scale mining sites which are in Geita district. Measurements were taken in the gold –mercury amalgam burning areas (where mercury-gold amalgam is burnt to evaporate mercury in order to obtain gold-dore (partially burned gold that contains some mercury and other impurities) which contains some residual mercury), gold ore sluicing and concentrating ponds as well as in open spaces within processing areas. During measurement process, the Lumex machine was hand held at 1m above the ground while observing that there are no heavy winds and there are no rains (during dry season).

IV. **Mbeya region**: Measurements were taken in 1 industrial area, 1 dumping site, 1 school, 1 gathering area, 5 health centres/hospitals, 2 dental clinics which are located in Mbeya town and 7 small scale mining sites which are in Chunya district. In all health care sites, mercury level measurements used the adopted healthcare measurement procedure while mining centres measurements followed the adopted mining sites measurement procedure as was done in Geita.

2.4.2 Conduct *Say…aaaHg! Campaign*

The Say ....aaaHg! Campaign - taking measurement of mercury emissions in people's mouths before and then after providing them with a chewing gum, which they then had to remove - was conducted in different sites visited in all four regions. This was done concurrently with the mercury level measurement activity. Different people were involved in this activity such as in schools whereby teaching staff and student participated in the action while in hospitals and dental clinics, nurses and doctors

participated too. After completing taking mercury levels measurements in schools and in dental clinics, teachers and students as well as patents, doctors and nurses respectively were invited to participate in the campaign and it can be estimated that about 200 people participated in the campaign while others were onlookers. Fact sheets were provided to those who participated as well as posters were put on strategic locations in dental sections as well as mercury exposure through consumption of mercury contaminated fishes. The immediate reaction that was recorded and reported to the National coordinator of the Dental Department within the ministry of Health and Social Welfare was that many patients in the hospitals with the project posters were requesting additional information on the mercury alternatives, mercury health effects and treatments of mercury exposure.

Fig. 2.2: a teacher and a student practicing Say ….aaaHg! campaign

CHAPTER 3: STUDY FINDINGS

3.1 USE OF MERCURY

In Tanzania, mercury is still in use to large extent particularly in dental healthcare, education sector and artisanal and small scale gold mining activities. During project implementation, it was found that many of the mercury users use mercury while they are aware that mercury is hazardous and poses health treats.

In the hospitals and health care centres (government and private owned), mercury-containing instrument are still in use and some are in the process of being phased out however, the speed of phase out is still low. Many dental clinics still use silver-mercury amalgam due to the fact that is the cheapest method and some of the doctors still believe that this method is the strongest one and last longer even though it tends to change filled tooth colour and mercury refilling on the previous mercury filled tooth becomes more difficult.

Furthermore, in schools, mercury containing instrument and reagents are still used due to the fact that, the reagents and instruments stocks received containing only those equipments; hence need for change from the procurement policy level of the ministry as well as the owners of private owned schools. During regional information sharing meetings, we shared information and experiences that were observed in different areas and proposed best practises in order to minimise and eventually eliminate mercury uses in different sectors involved. Moreover, two AGENDA staff attended the Technical Meeting and Annual General Meeting (AGM) of the Tanzania Dental Association (TDA) that was carried out in the last week of November 2013 while accompanied with Dr. Graeme Munro who is a well-known International dental doctor who works with Mercury Free Dentists, based in United Kingdom. During the meeting, information about mercury free technologies and mercury exposure levels to healthcare workers in dental sections were shared. In the course of the preparation and conduction of the Tanzania Dental Association Annual general meeting, AGENDA staff consulted and shared preliminary

results of this study and managed to persuade Dental Health Coordinator of the Ministry of Health, Dr. M. Kabulwa to spear head mercury free dental services in Tanzania and assured him support in his campaign.

In addition to that, in artisanal and small scale gold mining, small scale gold miners still use mercury as their only means of capturing a lot of gold and also cheaper compare to alternatives which are still not very popular to many miners and not very well developed in the country. AGENDA has propagated a number of technologies to minimise mercury emissions as well as alternatives to mercury. AGENDA is still finding ways to make miners adopt alternative technologies in collaboration with other stakeholder on shifting miners away from mercury uses in small scale gold mining.

3.2 MERCURY IN HEALTH CARE

In all four regions, a total of 21 healthcare centres were covered which included 12 hospitals and 9 dental clinics.

In most of health care centres, mercury is still used in equipment, products and dental filling processes. Some of the hospitals engaged have phased out mercury containing instrument such as thermometer and sphygmomanometer and currently use alternatives while still use silver-mercury amalgam in dental fillings. Dental doctors are aware of alternatives of silver-mercury amalgam for dental filling such as composite and glass ionomer but some of them prefer more silver-mercury amalgam due to its price cheapness and some claim that many patients prefer amalgam more than other alternatives. This was also because during project implementation, we also put several posters in schools, hospitals and mining centres. For those who heard about the dangers posed by mercury exposure through by reading the posters and other awareness materials they tend to request for explanations from the doctors and requesting for alternatives.

It was further found that, many dentists of government owned hospitals are aware of health impacts of mercury and are trying to avoid its use even though mercury amalgam

is the only dental filling material received from the Medical supply chain. As they are employees of the government, they have no alternative option rather than to continue using mercury amalgam as dental filling material while trying hard to minimise the number of fillings they make per day. Whenever, mercury alternatives are available such as composite, glass ionomer, ceramics and others, dentists tend to use more alternatives and stop using mercury amalgam until the stock finishes, and then they once again start using mercury amalgam again. Sometimes, dental patients prefer using mercury amalgam (even if advised on the alternatives) which forces dentists to use mercury amalgam. Their comments mainly were that government should stop purchasing these materials and purchase the mercury-free alternatives as well and issue a new policy of no mercury materials in the hospital.

Measurements that were taken within the healthcare centres showed varied levels of mercury in the air. In the wards, dumping sites, and open space the level of mercury measured in the air was rather low, ranging from 4ng/m^3 to 200ng/m^3 . The amount of mercury found in the store room was high as many stores are closed with no ventilation hence no frequent air exchange. In the dental sections and dental clinics, indoor mercury levels were moderately above the WHO limits (300 ng/m^3 is the maximum safe limit of exposure) in the facilities that have high ventilation with open big windows while mercury levels were very high in the facilities with low ventilation or with closed windows as well as use air conditioning (AC) equipment such that frequency of air exchange is low.

Also during Lumex measurements, the levels of mercury in the dental room seem to be very high in the filling process compared to the no filling situation. It was recorded that the level would shoot up to 9655ng/m^3 during the mercury amalgam filling. This measurement clearly shows that a patient and a doctor inhale a lot of mercury during the filling process, as the maximum allowable indoor exposure levels of mercury is 300ng/ m^3 (WHO).

As part of the project implementation, sharing of the results was done after conducting measurement in each region by holding focused group discussions with stakeholders for sharing experiences and then proposing the way forward in order to improve occupational safety on working areas.

3.3 MERCURY IN SMALL SCALE MINERS.

In artisanal and small-scale gold mining, mercury is still in use for gold recovery process. It was found that almost all artisanal and small scale miners use mercury on gold recovery process and no personal protective equipment is used to minimise exposure. It was observed that in the burning area mercury was too high comparing to washing and other areas. The level shoots up to >50,000ng/m^3 in burning areas hence demonstrate that people who are involved in the burning inhale a lot of mercury. People nearby are also exposed to mercury fumes while unaware, as higher levels of mercury were also found in the general open area near the miners sites, that means even people who do not engage themselves in the mining process are still affected.

After conducting measurement in each small scale mining site we convened a short meeting with miners within the site for information sharing about the results obtained as well as explaining to miners on health effects of mercury and available alternatives that could be used in order to eliminate mercury uses such as Borax as well as forming groups (as advocated by the ministry of Energy and Minerals) in order to access support for starting up medium scale gold processing by using cyanide. In addition to that, we also updated miners on the progress of the Minamata convention ratification process and what could be expected after entering into force as well as available opportunities in improving miners livelihood.

Fig. 3.1: Measurement of mercury in the washing and burning sections in small scale miners in Geita region

3.4 MERCURY IN SCHOOLS

During measurements that were carried out in different parts of schools, mercury was found in the air at varied levels. There were moderate mercury levels in the schools' stores where all chemicals and apparatus are kept as many stores were closed with low ventilation. Reduced ventilation in the stores hinders or reduces the rate of air exchange hence some readings reached up to 300ng/m^3 in the laboratories for schools that are located in well developed urban areas (Dar es Salaam city) while for schools that are located within upcountry and rural areas, mercury levels recorded reached 260 ng/m^3 within the laboratories. Mercury was found to be too low as all schools were observed to have open windows that allows free flow of air and we were also informed that mercury is not used within those rooms frequently. In the classrooms, dumping sites and open spaces of the schools, mercury levels were found to be too low.

Before taking mercury measurements, we had lengthy discussions with schools administrations and teachers as well as after completing taking measurements for sharing results. Moreover, focused group discussions after completing regional measurements was also used to share experiences of different sites covered for wider coverage as well as sharing experiences among participants themselves.

3.5 MERCURY IN DUMPING SITES, INDUSTRIAL AREAS AND GATHERING AREAS

In dumpsite areas, generally mercury was found to be too low. This was due to high wind speed and the areas being too open. The measurement range from 20ng/m^3 to 120ng/m^3 that shows as most of the dumpsite are open and well ventilated, mercury is rapidly evaporates and taken away by the wind. It was recorded that in areas where small scale miners are located nearby such as in Chunya town and Geita town, ambient mercury levels were observed to reach 120ng/m^3 while in towns and cities located far from the mining centre like Dar es Salaam, Mwanza and Mbeya, ambient air was recorded to have mercury levels at the range of 70ng/m^3.

3.6 *Say .....aaaaHg* CAMPAIGN FOR MEASURING RELEASES FROM PEOPLE

The *Say ....aaaaHg* campaign was carried out in all places (schools, hospitals, gathering areas, e. t. c) where mercury levels in the air were measured. The campaign involved taking measurement of the mercury emissions on people's mouths after providing the volunteer with a chewing gum that he/she chew for about 30 seconds and spitted out. After spitting the chewing gum, the volunteer will be breathing on the measuring tube that is connected to the Lumex machine for about two minutes and record the mercury level reading on the piece of paper. Measurements in the campaign ranged between 2ng/m^3 and 40ng/m^3 for the volunteers within upcountry regions, while for Dar es Salaam region campaign it was observed that the reading was ranging from 18ng/m^3 and 86ng/m^3. From the readings it could be noted that for upcountry regions, most of the participants in the campaign did not have amalgam dental fillings while some of the Dar es Salaam participants had amalgam dental fillings. Each of the volunteers was provided with the paper showing emissions reading level from his/her mouth. After completing the measuring exercise in a site where we carried the *Say ....aaaaHg* campaign, we gathered for few minutes to share information and explaining what is the meaning of the exercise as well as informing people the effects of mercury to human and advising the best possible options in order to minimise exposure of

mercury to human as well as the Minamata convention meaning to the community and its associated process for our country to be party to the convention. Moreover, after completing measurements in each region, we had focused group discussions with stakeholders sharing results and information and during those meetings we continued carrying out *Say ....aaaaHg* measurements which was very useful and helped stakeholders to comprehend our arguments on mercury emissions for dental fillings and most of them wished to replace their mercury dental fillings with alternatives.

3.7 CREATING AWARENESS ON MERCURY EFFECTS ON HEALTH

Posters and brochures in English and Kiswahili languages were produced as part of our awareness creation efforts that were based on mercury measurements as well as its associated health impacts. In addition to that, awareness materials including information on existing alternatives for mercury products and equipments, were produced and shared in all regions AGENDA team visited as well as in the Tanzania Dental Association Annual General Meeting that was carried out in the last week of November 2013.

Moreover, as part of sharing information and creating awareness , two AGENDA staff participated on Tanzania Dental Association (TDA) Annual General Meeting and Conference. During that meeting, we shared information with participants on mercury exposure to dental sector workers and then urged to eliminate mercury uses as well as the need for early ratification of the Mercury convention.

In addition to that, a press release of the study results was issued in Dar es Salaam. That was followed by newspaper articles (Audio and Television – Star Television) that covered the press release as well as one-onone radio interviews that were also carried out as part of general public awareness creation and information sharing. In addition to that, we also shared project results with government officials as well as involved stakeholders regarding the need for early ratification of the Minamata Convention.

3.8 COMPARISON OF MERCURY LEVELS IN GOVERNMENT AND PRIVATE DENTAL HOSPITALS AS WELL AS ARTISANAL AND SMALL SCALE MINING CENTRES

Generally, it was noted that artisanal and small-scale mining centres/areas showed the highest levels of mercury levels and privately owned dental hospitals came second while the government owned dental hospitals came in third (see Annex 1). Uses of dental filling materials in the government owned facilities is guided by the Ministry of Health and Social welfare procurement and guiding policies while in private dental clinics it is guided by the clinic administration. Some of the private clinics are continuing to use mercury amalgam while some of the private dental clinics use alternatives.

3.9 AWARENESS LEVELS ON MERCURY EFFECTS AND ALTERNATIVES

Generally, it was noted that awareness on mercury impacts is varying from one sector to the other. In the medical sector, the mercury level was medium and as you go up the ranks of dental doctors, awareness increases while awareness goes down as you go further into remote areas in upcountry regions. This is mainly attributed to the limited access to electronic and internet services in remote areas. Dental doctors with higher awareness tend to limit their uses of mercury in their daily works when no other dental filling materials are availed to them in government owned facilities. Therefore they usually keep windows open in the dental rooms to enhance ventilation all the times to minimise occupational mercury exposure.

Moreover, artisanal and small scale miners showed medium to higher level of awareness to mercury exposure risks, as many miners are aware that mercury is dangerous to their health. At the same time, they demonstrated lower levels of awareness to alternatives and technologies to protect themselves from exposure, hence causing mercury's continued use in gold recovery processes. However, many miners showed interest on receiving adequate and efficient safe technologies to improve their working conditions as well as capturing more gold to improve their livelihoods.

Awareness in schooling sector showed medium to lower level of awareness, as much mercury occupational exposure information is shared within the teaching curricular.

It had also been noted that in all hospitals where project posters had been tacked up, dental patients had begun questioning their doctors on the health effects of dental fillings. Specifically, questions were raised to their doctors on whether they were planning to use mercury amalgam on their teeth, and also requests were made for safer filling materials. As mentioned in section 3.1, preliminary results of this study have been shared with the hospitals in the Ministry of Health and Social Welfare as well as National Dental Department Coordinator. As a result, the ministries took note. As a result, the coordinator has started to initiate approaches to phase down mercury in dental practises within the government owned hospitals system. Moreover, the results have been also shared among dental doctors who participated in the technical meeting and Annual general meeting of the Tanzania Dental Association that was held in the last week of November, 2013 in Peacock Hotel, Dar es salaam. Some private hospitals like the administration of the Aga Khan hospital in Mwanza city have committed themselves to make available alternative dental filling materials.

3.10 FOLLOW UP STEP AFTER THE STUDY

After completion of the study, AGENDA is planning to carry out additional mercury body burden levels on dental sections workers so as to gather more mercury exposure data that will show how dental workers are more exposed to mercury. Doing this is likely to garner more support from dental workers on phasing down mercury uses in dental sections within the health care system. This may be achieved by conducting a small study of mercury in the hair of the dental health workers, covering those regions where we conducted the Lumex measuring activities.

In addition to that, we are continuing to raise public awareness through various media outlets by highlighting the results of this study as well as informing the community on

the current status of our government on ratification process of the Minamata Convention as well as continuing pushing for early ratification.

CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

From study finding, it can be concluded as follows:

1) Indoor mercury levels were observed to be in higher concentrations in closed areas with less air exchange rate than in the open and ventilated areas;
2) With closed rooms and reduced ventilation, inhabitants of those rooms are highly exposed to mercury vapours that ranged between 1319 ng/m^3 and 5641 ng/m^3 while WHO maximum recommended safety level is 300 ng/m^3. It was also noted that some of the dentists have observed to have headaches when conducted many dental filling within a day with reduced ventilations;
3) Many doctors and health workers, particularly in urban areas, appear to have adequate knowledge on health impacts threats caused by mercury. However they don't advise their patients on mercury risks resulting in low awareness of mercury threats to patients and the general public;
4) In dental schools, the first technique to be taught and practiced is the placement of mercury amalgam. (and given more emphasis) while alternative are taught after this. However, during training, exposure to mercury vapour is not emphasised. In addition to that, many older dentist who have high experience on using mercury amalgam do not have experience on using the alternatives, even though they have also been informed about alternatives.
5) It is up to Government ministries to reshape their procurement policies in order to successful phase out mercury products and equipment by focusing on alternatives;
6) Less information on artisanal and small scale gold mining recovery technology is shared among its stakeholders. Limited information in small scale gold mining recovery technology and mercury emissions reduction is shared among its stakeholders and alternative to mercury technology is shared to miners;

4.2 RECOMMENDATIONS

It can be recommended as follows:

a) Improve ventilation as well as frequency of air exchange in dental filling rooms;
b) Doctors should be made aware of mercury risks and provide adequate advice on mercury health risks to dental filling patients;
c) Government ministries should change their procurement policies in order to successfully phase out mercury products and equipment by focusing on alternatives;
d) Government relevant ministries should place more emphasis and include in the education system training programmes and courses information on the use of mercury alternative dental filling materials so that dentist could use mercury alternative filling materials confidently and effectively;
e) Awareness creation on artisanal and small scale gold mining recovery technology and mercury emissions reduction technologies is shared among stakeholders;
f) More research should be carried out on mercury alternatives technologies for gold recovery and disseminations of best available technologies as well as best environmental practises to artisanal and small scale gold mining;
g) More support should be provided to miners on existing mercury alternative technologies for artisanal and small scale gold mining and gold recovery; and
h) The government of Tanzania should hasten the process of ratification of the Minamata convention.

ANNEXES

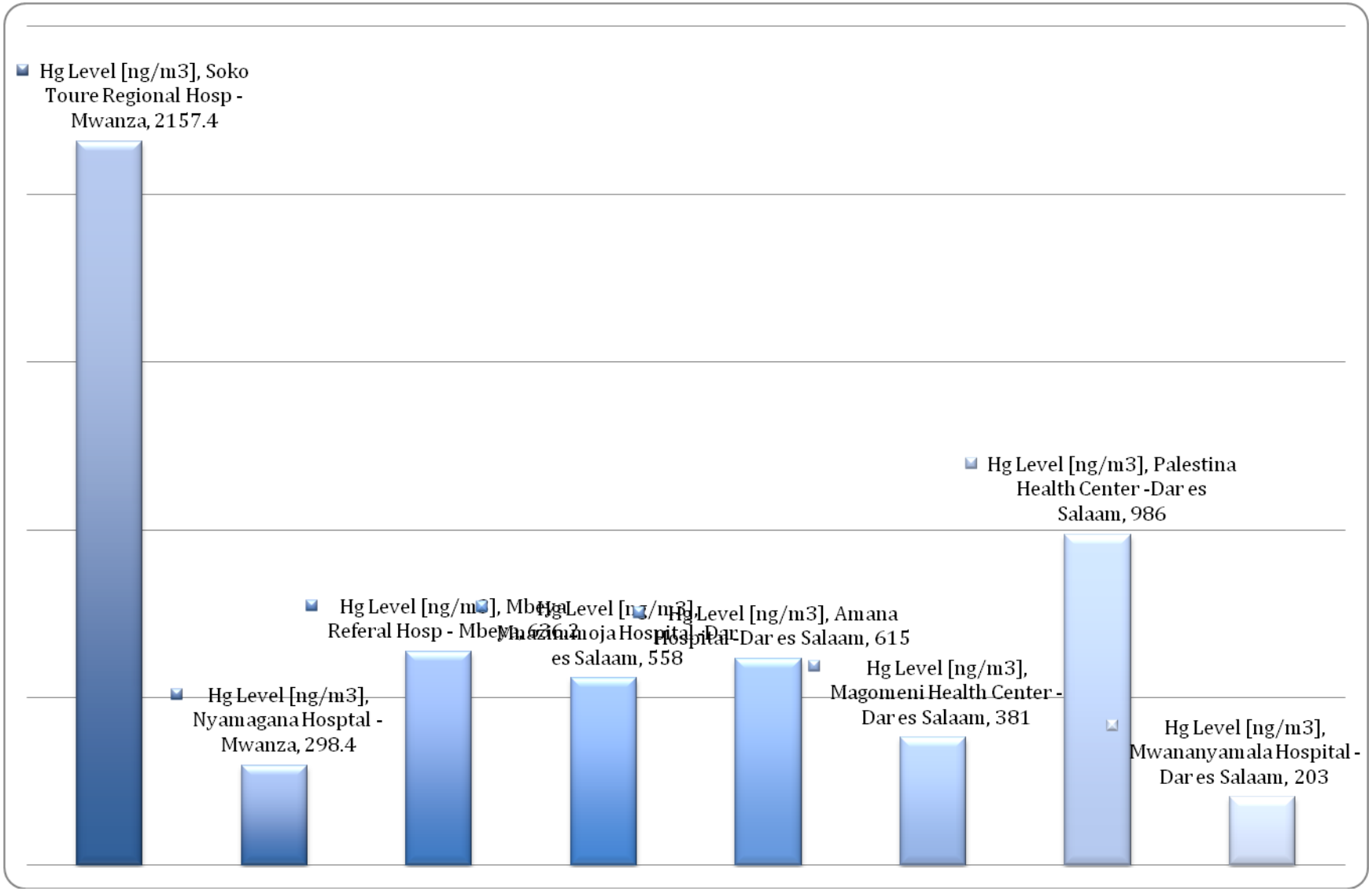
ANNEX 1: MEASUREMENT TABLES AND GRAPHS

Table A1: Average Mercury Levels in the Air Measured in Government And Private Owned Hospitals and Dental Clinics During Dental Filling Process

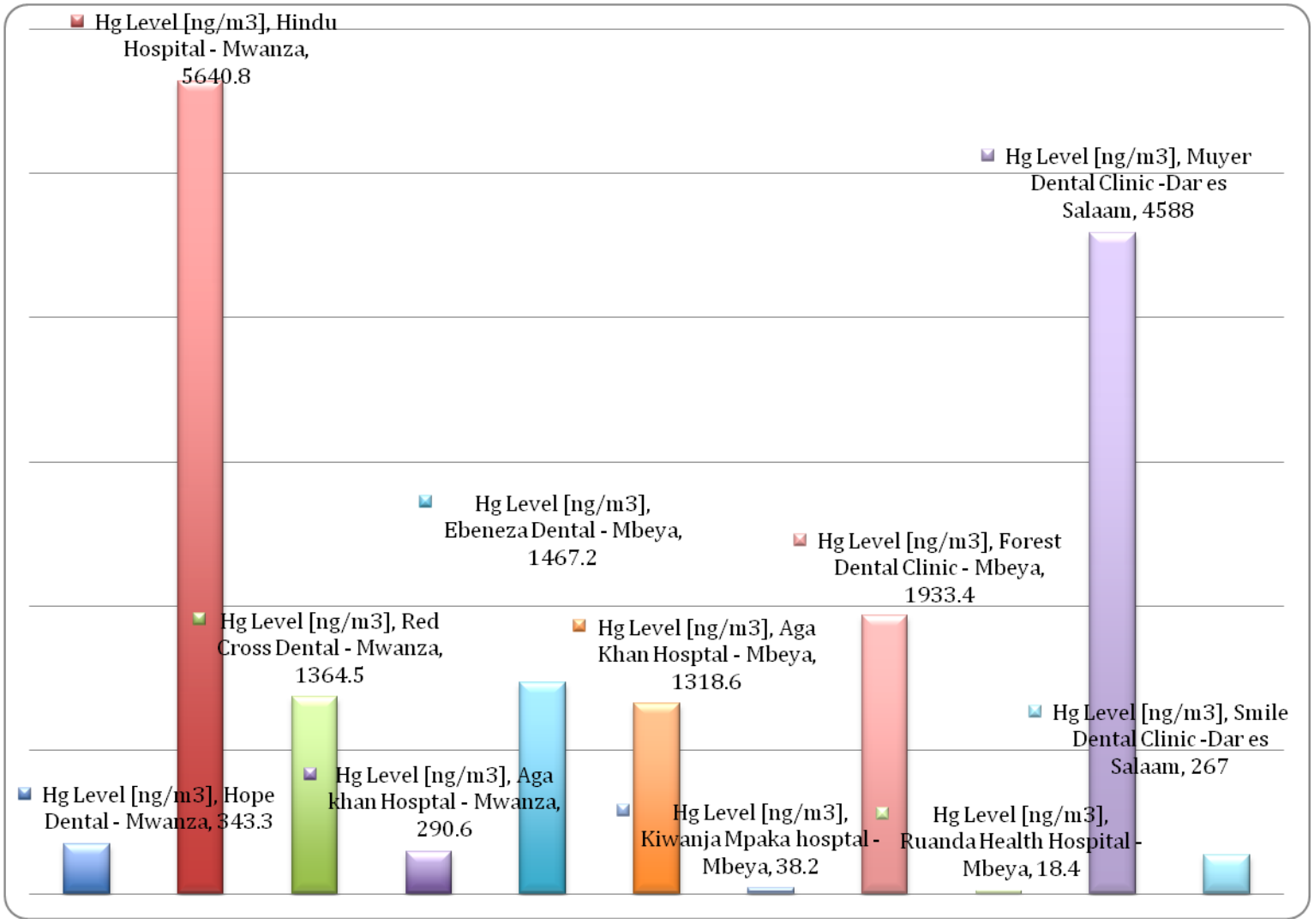
Region	Site name	Ownership	Hg Level [ng/m^3]
Mwanza	Soko Toure Regional Hospital	Government	2157.4
	Nyamagana Hospital	Government	298.4
	Hope Dental	Private	343.3
	Hindu Hospital	Private	5640.8
	Red Cross Dental	Private	1364.5
	Aga khan Hospital	Private	290.6
Mbeya	Mbeya Referal Hospital	Government	636.2
	Kiwanja Mpaka hospital	Government	38.2
	Ebeneza Dental	Private	1467.2
	Aga Khan Hospital	Private	1318.6
	Forest Dental Clinic	Private	1933.4
	Ruanda Health Hospital	Private	18.4
Dar es Salaam	Mnazimmoja Hospital	Government	558
	Amana Hospital	Government	615
	Magomeni Health Center	Government	381
	Palestina Health Center	Government	986
	Mwananyamala Hospital	Government	203
	Muyer Dental Clinic	Private	4588
	Smile Dental Clinic	Private	267

Table A2: Average Mercury Levels in the Air Measured in Mining centres located Geita District, Geita Region and Chunya district, Mbeya Region During Amalgamation and burning taking place

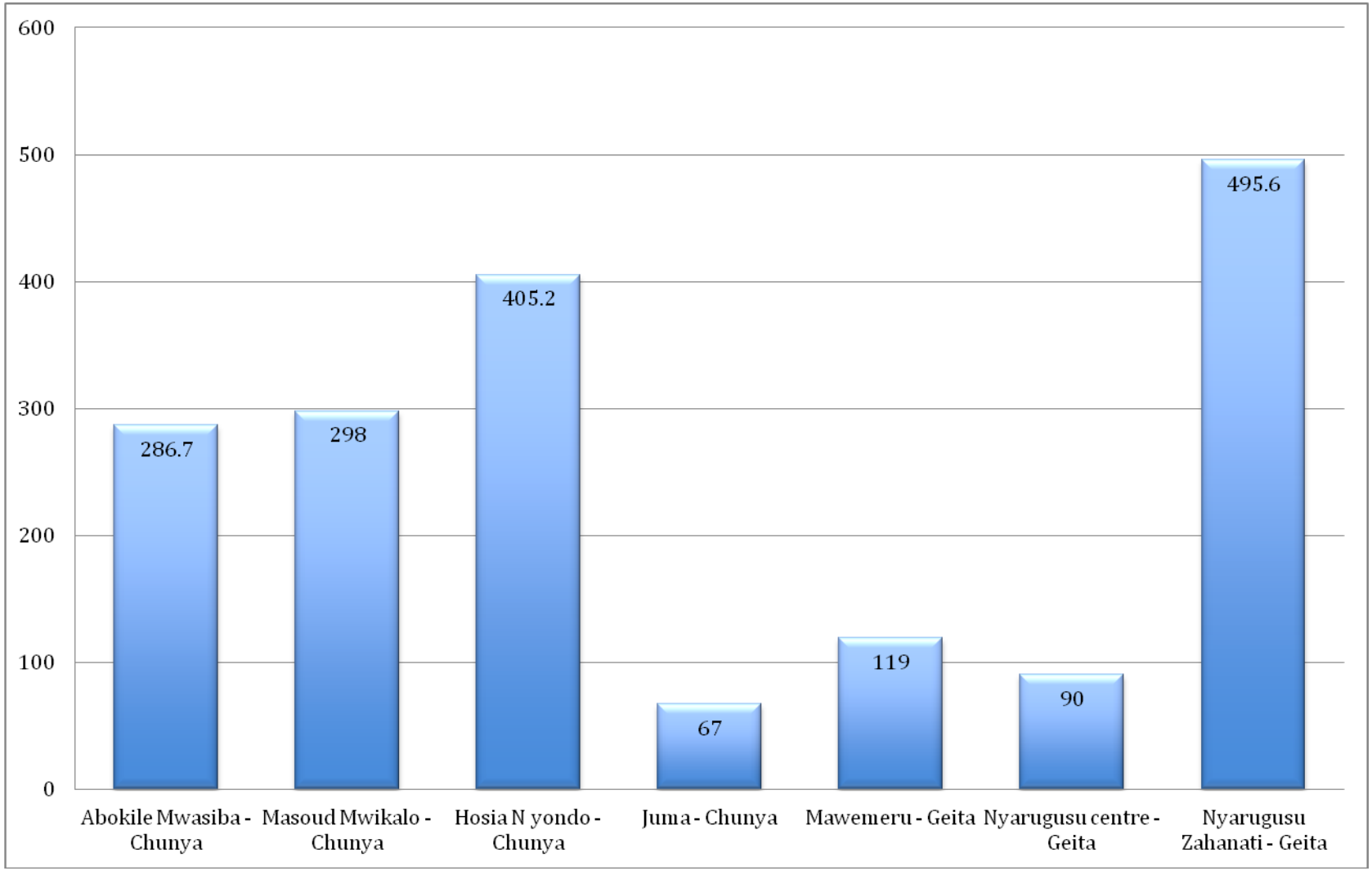
Region	Site name	Prcoess	Hg Level [ng/m^3]
Chunya, Mbeya Region	Sompo Mashaka - Chunya	Amalgamation and burning	6380.8
	Yohana Bandari - Chunya	Amalgamation and burning	3268.2
	Kifaruka Betwel - Chunya	Amalgamation and burning	31356.4
	Kurumba Msigwa - Chunya	Amalgamation and burning	1043
	Abokile Mwasiba - Chunya	Amalgamation	286.7
	Masoud Mwikalo - Chunya	Amalgamation	298
	Hosia N yondo - Chunya	Amalgamation	405.2
	Juma - Chunya	Amalgamation	67
Geita, Geita Region	Buziba – Geita	Amalgamation and burning	4485
	Nyarugusu gold mine - Geita	Amalgamation and burning	14884.8
	Nsangano - Geita	Amalgamation and burning	2859.8
	Mawemeru - Geita	Amalgamation	119
	Nyarugusu Zahanati - Geita	Amalgamation	495.6
	Nyarugusu centre - Geita	Amalgamation	90



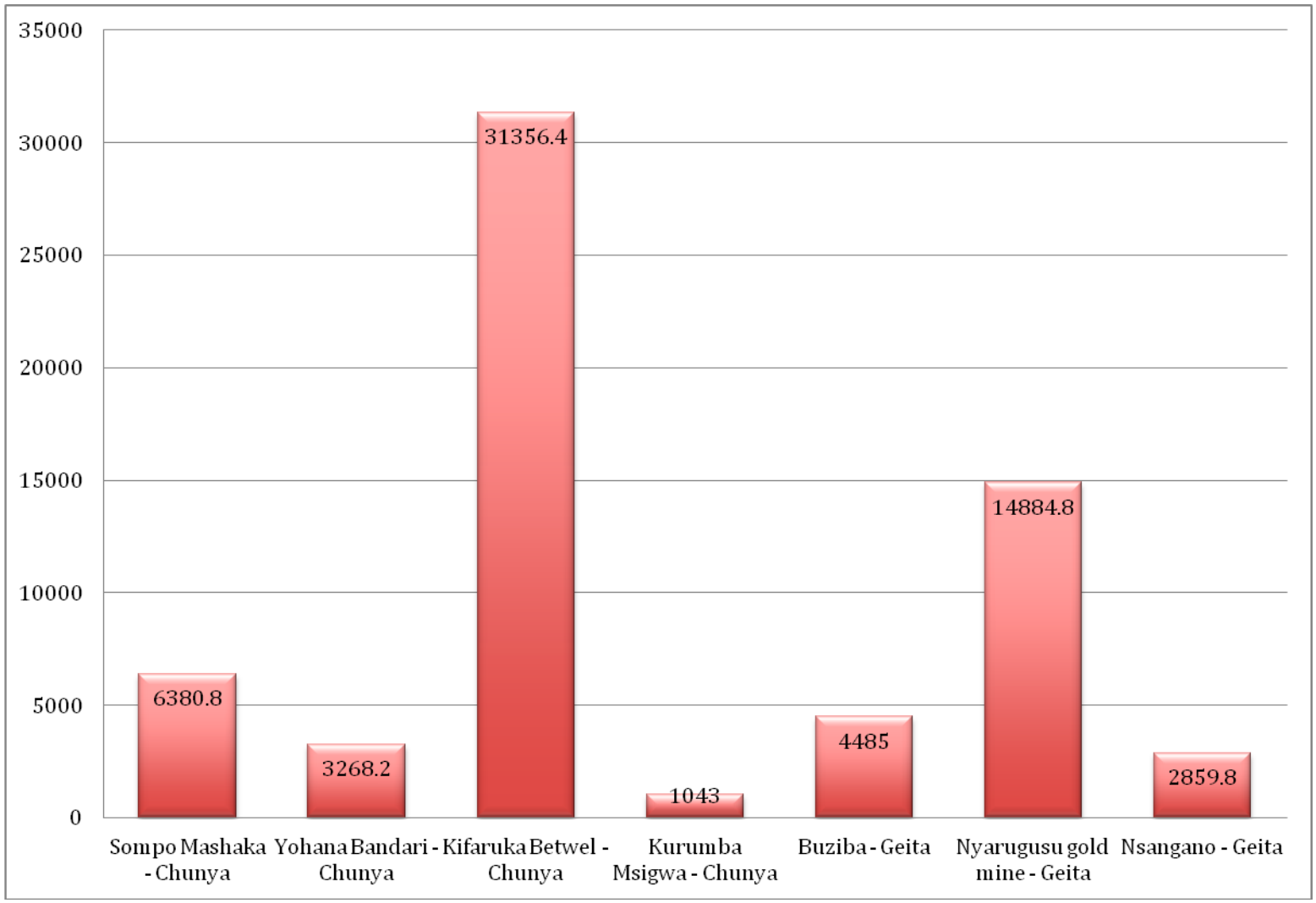
Graph G1: Chart of mercury levels measurements in Government Owned Hospitals during dental filling processes



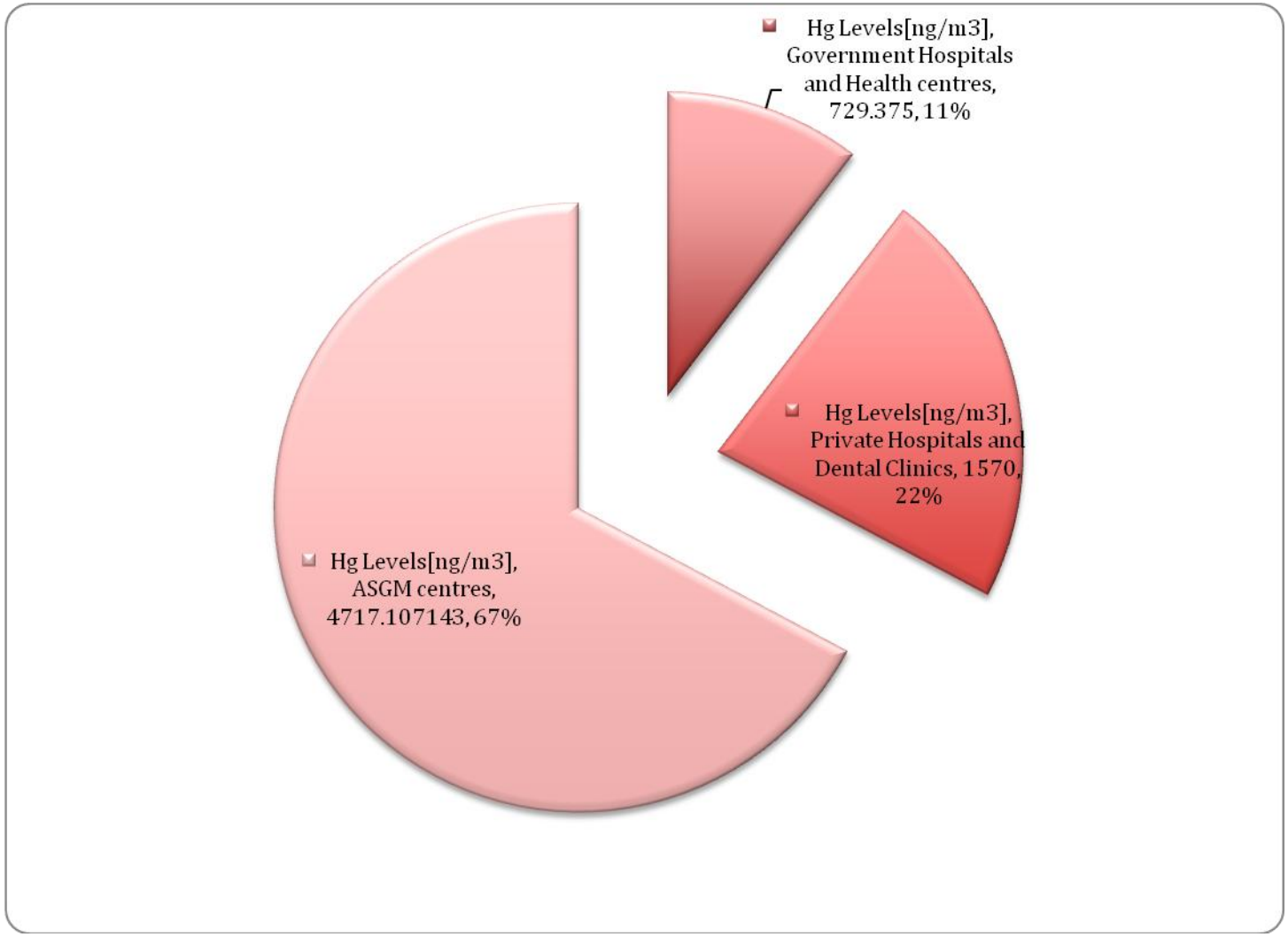
Graph G2: Chart of mercury levels measurements in Private Owned Hospitals



Graph G3: Chart of mercury levels measurements in Artisanal and Small Scale Gold mining Centres During Amalgamation Process



Graph G4: Chart of mercury levels measurements in Artisanal and Small Scale Gold mining Centres During Amalgamation and Open Burning Processes



Graph G5: Chart of mercury levels measurements Comparison among Government and private Owned Hospitals as well as Artisanal and Small Scale Gold mining centres

ANNEX 2: AWARENESS MATERIALS

ONDOA MATUMIZI YA ZEBAKI (Hg)

ZEBAKI NI NINI?

Ni madini tembo inayopatikana katika mazingira na ni metali pekee inayokuwa kwenye hali ya umaji katika jotoridi la kawaida. Zebaki huingia hewani wakati mawe yenye zebaki yanapomong'onyoka, volkano ikilipuka,makaa ya mawe au mafuta yakichomwa, taka zenye zebaki zikiunguzwa na zebaki ikivukizwa

ZEBAKI INA MADHARA GANI?

Husababisha madhara makubwa kwenye mifumo mbalimbali yam-wili: fahamu, umeng'enyaji chakula, kupumua (kuharibikamapafu), kinga na njia mkojo (figo).

i. Mwili kutetemeka, kupungua nguvu za macho na masikio, kiharusi and mabadiliko ya hisia yasiyotengemaa;
ii. Mfumo wa fahamu hasa kwa wanawake walio katika umri wa kubeba mimba;
iii. Kuharibika kwa vinasaba (DNA na chromosome);
iv. Huleta mzio ambao husababisha vipele, uchovu na maumivu ya kichwa;
v. Athari katika mfumo wa uzazi: kuharibika mbegu za uzazi, ulemavu wa kuzaliwa, matatizo ya kujifungua, kutokukua ipasavyo kwa mimba na mtoto.

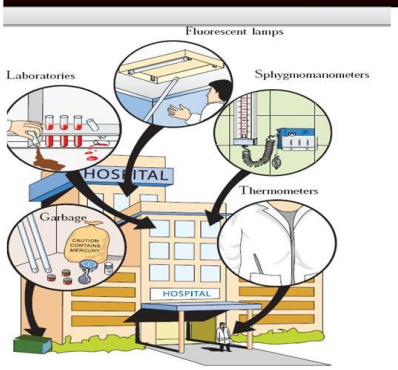
JINSI YA KUJIKINGA NA MADHARA YATOKANAYO NA ZEBAKI KATIKA HUDUMA ZA AFYA

i. Ondoa Zebaki iliyomwagika kwa kuzingatia taratibu sahihi zilizowekwa eneo la kazi;
ii. Anzisha utaratibu maalumu wa kushughulikia taka zenye zebaki
kuhakikisha haiingii kwenye mfumo wa majitaka / matanuru ya
taka / madampo ya taka;
iii. Uongozi utekeleze sera za kupunguza matumizi ya zebaki na
kununua vifaa visivyo na zebaki;
iv. Mafunzo yatolewe kwa wafanyakazi wote kuhusiana na athari za
zebaki;
v. Ikiwa haitumiki, hakikisha makasha ya zebaki yame-fungwa vizuri

KWA WACHIMBAJI WADOGO:

- Matumizi ya dhahabu kwa wachimbaji wadogo ni hatari sana na husababisha athari kiafya kwa wananchi.
- Teknolojia zisizohusisha zebaki na sayanaidi zihamasishwe na kupewa kipaumbele na pale zebaki inapotumika itumike ipasavyo na kwa usahihi ili kujiepusha na athari zake.

VYANZO VYA ZEBAKI KATIKA NYANJA MBALI MBALI



Vyanzo vya zebaki katika huduma za afya

Baadhi ya vifaa vya maabara na kipima joto vyenye zebaki

Matone ya zebaki yanayo-tumika shuleni na katika huduma za afya.

Zebaki iliyozibia jino lililotoboka

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IMEFADHILIWA NA:

ELIMINATE MERCURY (Hg):

WHAT IS MERCURY?(Hg)

Mercury is a heavy metal occurring naturally and it is the only metal which is liquid at ordinary temperature.

WHAT ARE THE EFFECTS OF MERCURY?

- *Generally causes harmful effects to body systems: nervous, digestive, respiratory (lung damage), immunity and urinary (kidneys).*
- *Tremors, impaired vision & hearing, paralysis, insomnia, emotional instability,*
- *Neurological problems especially dangerous for women of child bearing age;*
- *DNA and chromosomal damage;*
- *Allergic reactions resulting in skin rashes, tiredness and headaches.*
- *Negative reproductive effects: sperm damage, birth defects, miscarriage, developmental deficits during pregnancy and child hood.*

TO PREVENT HEALTH HAZARDS RE-SULTING FROM MERCURY EXPOSURE AT DENTAL SITES

Reduce mercury waste at source and adopt best in-house environmental prac-tices. (Cross ventilation; Exhaust fans; Mercu-ry waste management)

Use of capsulated mercury amalgam and mechanized mixing.

Promotion of non-mercury dental fillings alternative materials.

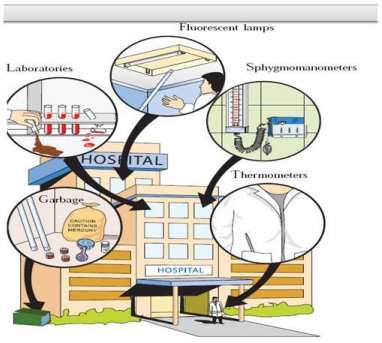
Development and implementation of mercury specific policy, legislation, including national emissions/releases standards, minimum mercury levels in products, licensing protocols for private institutions.

Minamata Convention on mercury (2013) be signed and ratified by government at the earliest.

FOR ARTISANS AND SMALL SCALE MINERS (ASGM)

Mercury use in artisanal and small-scale gold mining is particularly hazardous, and health effects on vulnerable populations are significant. Non-mercury (non-cyanide) gold-extraction techniques need to be promoted and implemented, and where mercury is still used safer work practices need to be employed to prevent exposure.
Phase out use of non-essential mercury-containing products and implement safe handling, use and disposal of remaining mercury-containing products.

SOME SOURCES OF MERCURY



Sources of mercury in a hospital

Mercury filled thermometer and some laboratory chemicals used in schools

Drops of elemental mercury used in schools and (ASGM)mining areas.

Dental Amalgams

Supported By:

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AGENDA
For Environment and Responsible Development

zero Hg
mercury working group

ANNEX 3: FACTS SHEETS SHARED WITH STAKEHOLDER

FACTS ABOUT MERCURY (Hg)

KEY FACTS

- Mercury is a naturally occurring element that is found in air, water and soil.
- Exposure to mercury – even small amounts – may cause serious health problems, and is a threat to the development of the child *in utero* and early in life.
- Mercury may have toxic effects on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes.
- Mercury is considered by WHO as one of the top ten chemicals or groups of chemicals of major public health concern.
- People are mainly exposed to methylmercury, an organic compound, when they eat fish and shellfish that contain the compound.

HUMAN CAN BE EXPOSED TO MERCURY THROUGH:

- **inhaling;**
- **Contact with the skin;**

WHERE IS MERCURY?

Mercury is contained in many products, including:

- batteries
- measuring devices, such as thermometers and barometers
- electric switches and relays in equipment
- lamps (including some types of light bulbs)
- dental amalgam (for dental fillings)
- skin-lightening products and other cosmetics
- pharmaceuticals.

HEALTH EFFECTS OF MERCURY

- Generally causes harmful effects to bodysystems: nervous, digestive, respiratory (lung
- damage), immunity and urinary (kidneys).
- Tremors, impaired vision & hearing, paralysis, insomnia, emotional nstability,Neurological problems especiallydangerous for women of child bearing age;
- DNA and chromosomal damage;
- Allergic reactions resulting in skin rashes, tiredness and headaches.
- vNegative reproductive effects: sperm damage, birth defects, miscarriage, developmental deficits during pregnancy and child hood.

HOW TO REDUCE HUMAN EXPOSURE FROM MERCURY SOURCES:

- There are several ways to prevent adverse health effects, including promoting clean energy, stopping the use of mercury in gold mining, eliminating the mining of mercury and phasing out non-essential mercury-containing products.
- Promote the use of clean energy sources that do not burn coal.
- Burning coal for power and heat is the main source of mercury. Coal contains mercury and other hazardous air pollutants that are emitted when the coal is burned. Almost half of mercury emissions to air are from coal-fired power plants, industrial boilers and household stoves.
- Eliminate mercury mining, and use of mercury in gold extraction and other industrial processes.

Mercury is an element that cannot be destroyed; therefore, mercury already in use can be recycled for other essential uses, with no further need for mercury mining. Mercury use in artisanal and small-scale gold mining is particularly hazardous, and health effects on vulnerable populations are significant. Non-mercury (non-cyanide) gold-extraction techniques need to be promoted and implemented, and where mercury is still used safer work practices need to be employed to prevent exposure.

Phase out use of non-essential mercury-containing products and implement safe handling, use and disposal of remaining mercury-containing products.

SOURCES OF MERCURY (Hg)

Mercury Dental Amalgam

Elemental Mercury

Old Batteries

Mercury filled thermometer

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UKWELI KUHUSU ZEBAKI (Hg)

UKWELI MUHIMU:

- Zebaki ni elementi ya asili inayopatikana kwenye maji , hewa na udongo.
- Zebaki iiniapo mwilini hata kwa kiwango kidogo inaweza kusababisha madhara makubwa kiafya na ni tishio kwa mimba change na maisha ya awali ya watoto wadogo.
- Zebaki ina madhara makubwa katika mfumo wa fahamu, kinga za mwili, mapafu, figo na macho.
- Zebaki inachukuliwa na shirika la Afya duniani kama kemikali mojawapo katika kundi la kemikali tishio kwa afya ya binadamu.
- Watu huathirika na zebaki hatarishi zaidi pale wanapokula samaki na viumbe hai vya baharini vilivyopatwa na zebaki.

ZEBAKI HUINGIAJE MWILINI?

- **Kuvuta hewa**
- **Kupenya moja kwa moja kwenye ngozi**

ZEBAKI HUPATIKANA WAPI?

Zebaki hupatikana kwenye bidhaa nyingi kama vile:

- betri
- Vufaa vya kupimia:vipima jotoridi la mwili , presha na mgandamizo wa hewa.
- Sakiti za umeme na vifaa vyake.
- Risasi ya kuzibia jino lililotoboka
- Baadhib ya taa
- Vipodozi vya kuchubua ngozi na baadhi vinginevyo.
- Baadhi ya madawa ya binadamu.

MADHARA YA ZEBAKI KIAFYA

- Husababisha madhara makubwa kwenye mifumo mbalimbali ya mwili: fahamu, umeng'enyaji chakula, kupumua (kuharibika mapafu), kinga na njia mkojo (figo).
- Mwili kutetemeka, kupungua nguvu za macho na masikio, kiharusi and mabadiliko ya hisia yasi-yotengemaa;
- Mfumo wa fahamu hasa kwa wanawake walio katika umri wa kubeba mimba;
- Kuharibika kwa vinasaba (DNA na chromosome);
- Huleta mzio ambao husababisha vipele, uchovu na maumivu ya kichwa;
- Athari katika mfumo wa uzazi: kuharibika mbegu za uzazi, ulemavu wa kuzaliwa, matatizo ya kujifungua, kutokukua ipasavyo kwa mimba na mtoto

JINSI YA KUEPUSHA ZEBAKI KUINGIA KATIKA MWILI WA BINADAMU:

- Kuhamasisha matumizi ya nishati salama na kuacha kabisa matumizi ya zebaki migodini
- Kusitisha matumizi ya vifaa vyenye zebaki
- Kuhamasisha matumizi ya nishati bila kuunguza makaa ya mawe
- Uchomaji wa makaa ya mawe kama chanzo cha nishati ni chanzo kikubwa cha zebaki makaa ya mawe yana zebaki na vichafuzi vingine vya hewa vitokeapo pale yanapo-chomwa.
- Sitisha matumizi ya zebaki viwandani, migodini, shuleni na huduma za afya.
- Zebaki ni elementi ambayo haiwezi kuharibika basi zebaki inayotumika inaweza kure-jelewa kwa matumizi mengine ya muhimu pasipo kutumika migodini.
- Matumizi ya dhahabu kwa wachimbaji wadogo ni hatari sana na husababisha athari kiafya kwa wananchi.
- Teknolojia zisizohusisha zebaki na sayanaidi zihamasishwe na kupewa kipaumbele na pale zebaki inapotumika itumike ipasavyo na kwa usahihi ilim kujiepusha na athari zake.

- *Ondoa kabisa matumizi ya vifaa vyenye zebaki naq hamasisha matumizi sahihi na utupaji salama wa mabaki yatokanayo na bidhaa/ vifaa vyenye kemikali*

SOURCES OF MERCURY (Hg)

Zebaki iliyozibia jino lililotoboka

Tone la zebaki

Betri chakavu.

Kipima joto chenye zebaki

Imefadhiliwa na:

Mawasiliano:

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ANNEX 4: PRESS RELEASE DOCUMENTS

For Immediate Release **27th February 2014**

For More Information

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ALARMING LEVELS OF MERCURY IN DENTAL SECTIONS AND SMALL SCALE GOLD MINING AREA

A new report finds that high mercury exposure through air in the dental sections and small scale gold mining areas in Tanzania is alarming. AGENDA *for Environment and Responsible Development* (AGENDA) with support from Zero Mercury Working Group (ZMWG) carried out a study in four regions namely Dar es Salaam, Mwanza, Geita and Mbeya regions. The report highlights the urgent need for an overall reduction in mercury emissions as many government of the world has signed for the Minamata Convention (90 countries have signed to date) while processes for ratification of the convention is ongoing.

In all four regions, a total of 21 healthcare centres were covered which included 12 hospitals and 9 dental clinics as well as 14 small scale gold mining centres by using mass spectrometer mercury analyser (Lumex RA 915). In most of health care centres, mercury is still in use in equipment, products and dental filling processes. Mercury exposure to patents and dental sections workers as well as medical equipments store keepers is derived from mercury emissions from dental filling processes as well as leaking of mercury vapour emissions from medical equipments and products that contains mercury. Mercury exposure miners and nearby communities in small scale gold mining is derived from the gold ore amalgamation process using elemental mercury as well as panning and burning of mercury–gold amalgam in an open air without recovery systems.

Some of the hospitals have phased out mercury containing equipment such as thermometer and sphygmomanometer and currently uses alternatives while still uses silver-mercury amalgam in dental fillings. Dental doctors are aware of alternatives of silver-mercury amalgam for dental filling such as composite and glass ionomer but some of them prefer more silver-mercury amalgam due to its cheapness and some claims that many patients prefer amalgam more than other alternatives. It was further found that, many dental doctors of government owned hospitals are aware of health impacts of mercury and are trying to avoid its use even though silver-mercury amalgam is the main dental filling material received from the Medical supply chain. Due to limited information and awareness of working mercury alternatives, small scale gold miners continue to use mercury as their main gold recovery technique while there exists

alternatives such as Borax methods and cyanide leaching for medium scale gold miners.

Measurements that were taken within the healthcare centres showed varied levels of mercury in the air. In the wards, damping sites, and open spaces, mercury in the air was noted to be low, ranging from 4ng/m^3 to 200ng/m^3 while the amount of mercury found in the store rooms were high as many stores are closed with no ventilation hence low frequency of air exchange. In the dental sections and dental clinics, mercury was noted to be moderate above the WHO limits in the facilities that have high ventilation with open big windows while mercury levels were very high in the facilities with low ventilation or with closed windows as well as uses Air Conditioning (AC) equipment such that air exchange frequency is low. Levels of mercury in the dental rooms seem to be very high during dental filling process than in no filling situation. The level would shoot up to 9,655ng/m^3 during the mercury amalgam filling. This shows that patients and dental workers inhale a lot of mercury during filling while maximum allowable indoor exposure levels of mercury is 300ng/ m^3 (WHO-World Health Organisation).

In small scale gold mining areas, it was also noted that in the burning areas mercury levels were too high comparing to amalgamation, washing and other areas. The level shoot up to >50,000ng/m^3 in burning areas hence demonstrate that people who are involved in the burning of amalgam process inhale a lot of mercury as well as nearby communities are also exposed to mercury fumes while unaware as higher levels of mercury were also found in the general open area near processing sites, that means even people who does not engage themselves in the mining process are still exposed to mercury.

Generally, it was observed that artisanal and small scale mining centres/areas showed highest levels of mercury levels and private owned dental hospitals came second while the government owned dental hospitals came third.

The study therefore recommended the following:

a) Tanzanian government should ratify the Minamata convention sooner as well as take the leading role in minimising mercury emissions and eventual elimination;
b) There is a need to improve ventilation as well as frequency of air exchange in dental filling rooms;
c) Dental doctors should provide adequate advises on mercury health risks to dental filling patients;
d) Government ministries should consider changing their procurement policies in order to successful phase out mercury products and equipment by focusing on alternatives;
e) Awareness creation on artisanal and small scale gold mining recovery technology and mercury emissions reduction technologies is shared among stakeholders
f) More research be carried out on mercury alternatives technologies for gold recovery and disseminations of best available technologies as well as best environmental practises to artisanal and small scale gold mining
g) More propagation to miners on existing mercury alternative technologies for artisanal and small scale gold mining and gold recovery.

Imetolewa tarehe **27/ Februari/ 2014**

Kwa taarifa zaidi

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VIWANGO VIKUBWA VYA ZEBAKI KWENYE HEWA KWENYE VITENGO VYA KUZIBA MENO NA WACHIMBAJI WADOGO WA DHAHABU - TANZANIA

Taarifa mpya ya utafiti inaonesha kiwango kikubwa cha zebaki kwenye hewa katika vitengo vya kuziba meno na maeneo ya wachimbaji wadogo wa dhahabu uliofanywa na AGENDA *for Environment and Responsible Development* (AGENDA) kwa ufadhili wa "Zero Mercury Working Group" (ZMWG) katika mikoa ya Dar es Salaam, Mwanza, Geita na Mbeya inaripoti. Taarifa hiyo inaonesha uhitaji mkubwa wa kupunguza matumizi ya zebaki hivyo kupunguza uaichaji wake kwenye mazingira wakati serikali nyingi duniani simeshatia sahihi mkataba wa kimataifa wa Minama unaosimamia Zebaki (nchi 90 zimeshatia sahihi mpaka sasa) wakati mchakato wa kuukubali mkataba ukiendelea.

Katika mikoa yote mine, jumla ya vituo 21 vya afya ambavyo vilihusisha hospitali 12 na vituo vya kuziba meni 9 pamoja na maeneo ya wachimbaji wadogo wa dhahabu 14 vilifanyiwa utafiti kwa kutumia mashine aina ya "*mass spectrometer mercury analyser (Lumex RA 915)*". Katika vituo vya afya na hospitali nyingi, zebaki inatumiaka katika vifaa tiba pamoja na kuzibia meno. Wagonjwa pamoja na wahudumu wa idara za kuziba meno pamoja wa wafanyakazi wa maghala ya kuhifadhi vifaa tiba wanaingiwa na zebaki mwilini kutokana na uvikizwaji wa zebaki kutoka kwenye vifaa tiba na mchakato wa kuziba meno au kutoa zebaki iliyizibia meno. Wachimbaji wadogo wa dhahabu na jamii zinazowazunguka waningiwa na zebaki kutokana na mchakato wa ukamatishaji na uchomaji wa mbale (mchanganyiko wa dhahabu na zebaki) bila kutumia vifaa vya kukamata zebaki.

Baadhi ya hospitali na vituo vya afya vimeshaanza kutumia vifaa tiba mbadala ya vyenye zebaki kama vipima joto, shinikizo la damu lakini bado wanaendelea kuzibia meno kwa kutumia mchanganyiko wa silva na zebaki. Madakatari wengi wa meno wana ufahamu juu ya athari na mibadala ya kuzibia meno na silva-zebaki kama Kompositi (composite) and madini kioo (glass ionomer) lakini baadhi yao wanapendelea kutumi mchanganyiko wa silva-zebaki kutokana na urahisi wa bei na wengine wanadai kuwa wagonjwa wanapendelea kuzibiwa meno yao kwa silva-zebaki kuliko mibadala. Pia ilifahamika kuwa madaktari wa meno wa hospitali za serikali wanafahamu madhara ya zebaki lakini vifaa tiba wanavyoletewa kwenye hospitali zao ni vyenye silva-zebaki. Pia kutokana na kutopatikana taarifa sahihi kwa urahisi za mibadala ya zebaki kwa

wachimbaji wadogo wa dhahabu, wameendelea kutumia zebaki katika shughuli zao wakati kuna mibadala kama "Borax" na uyeyushaji kwa kutumia chumvi ya Sayanaidi kwa wachimbaji wa kati.

Utafiti uliofanyika kwenye hospitali vilionesha viwangi tofauti kwenye hewa kulingana na shughuli. Kwenye vyumba vya wagonjwa, maeneo ya kutupia taka na maeneo ya wazi yalionesha viwango vya zebaki kati ya 4ng/m^3 na 200ng/m^3 wakati kwenye maghala ya kuhifadhi vifaa tiba ilikuwa juu kwa kuwa huwa vinafungwa muda mwingi na hewa haibadiliki mara kwa mara ndani ya vyumba. Vyumba vya kuzibia meno vyenye madirisha makubwa yaliyo wazi yalionesha viwango vya kati nay ale yaliyofungwa na yenye mzunguko mdogo wa hewan yalikuwa nan viwango0 vikubwa zaidi. Viwango pia vilikuwa vya kati wakati hakuna uzibaji meno na wakati wa uzibaji meno kwa kutumia silva-zebaki vilikuwa juu zaidi. Wakati wa uzibaji viwango vya zebaki hufika mpaka 9,655ng/m^3. Hii inaonesha ni kwa kiasi gani wagonjwa na wahudumu wa vitengo vya meno wanavyopata viwango vikubwa vya zebaki miilini mwao wakati kiwango cha juu kinachoshauriwa na Shirika la Afya Duniani (WHO) ni 300ng/ m^3.

Kwenye maeneo ya uchimbaji mdogo wa dhahabu, ilionekana pia maeneo ya uchomaji mbale (mchanganyiko wa zebaki na dhahabu) kiwanngo cha zebaki kwenye hewa kilikuwa kikubwa zaidi ya maeneo ya ukamatishaji, uoshaji an mengineyo. Viwango vya zebaki vilikuwa vinazidi 50,000ng/m^3 ambayo inaonesha kuwa watu wanaoshughulika na uchomaji wanaingiwa na zebaki nyingi zaidi na wengine walio jirani bila kujitambua.

Kwa ujumla, ilionekana kuwa maeneo ya uchimbaji mdogo wa dhahabu ulionesha viwangu vya juu zaidi ukifuatiwa na hospitali za meno za binafsi nazo zikifuatiwa na hopitali za serikali.

Utafiti ulipendekeza yafuatayo:

a) Tunaiomba serikari ya Tanzania kuharakisha kukamilisha utaratibu wa kuuridhia haraka mkataba wa Minamata na ichukue uongozi katika kupunguza na kuondosha matumizi ya Zebaki nchini;
b) Kunahitajika juhudi za makusudi kuongeza zaidi ubadilikaji wa hewa ndani vyumba vya kuzibia meno;
c) Madaktari wa meno wawashauri fasaha wagonjwa wa meno kuhusu madhara ya zebaki kiafya kwa kina;
d) Wizara na idara za serikali wanahitajika kutafakari kwa kina kuhusu kubadil isera za manunuzi ya vifaa tiba kwa kuangalia zaidi vifaa tiba visivyo na zebaki;
e) Kunahitajika kuongezeana uelewa kwa wachimbaji wadogo wa dhahabu na wadau wengine kuhusu mbinu na teknolojia mibada ya zebaki;
f) Tafiti ziendelee kufanyika zaidi kuhusiana na mibadala na teknolojia muafaka (Best Available Technologies) pamoja na taratibu bora (Best Environmental Practises) kutumiaka kwenye uchimbaji mdogo wa dhahabu;
g) Inahitajika kusambaza zaidi taarifa za teknolojia mbadala wa zebaki muafaka kwa wachimbaji wadogo wa dhahabu kuhusiana na ukamataji wa dhahabu.

ANNEX 5: NEWSPAPER CUTTINGS

Zebaki inavyotishia maisha ya watu wanaoziba meno

Kwenye sekta ya afya hasa katika uzibaji wa meno, kuna athari zaidi.

Fredy Azzah, Mwananchi

Dar es Salaam. Zebaki ama kama inavyojulikana na wengi kwa jina la Mercury ni madini ambayo wengi tunajua athari zake pale inapotumiwa na wachimbaji wadogo wa madini ya dhahabu.

Wachimbaji huitumia Zebaki katika hatua ya kuitenga dhahabu na udogo, jambo ambalo huathiri afya za wachimbaji wengine na jamii inayowazunguka.

Mbali na wachimbaji, utafiti mpya uliofanywa hivi karibuni umeonyesha kuwa, Zebaki inaathiri pia wataalamu wa meno.

Wataalamu hawa wanaathirika wanapoziba meno ya wagonjwa kwa kutumia Zebaki.

Utafiti huo pamoja na mambo mengine, ulilenga kuangalia viwango vya Zebaki kwenye hospitali. Utafiti huo umefanywa na Shirika la Agenda for Environment and Responsible for Development, katika mikoa ya Dar es Salaam, Mwanza, Geita na Mbeya.

Katibu Mtendaji wa shirika hilo Silvan Mnga'anya, anasema kuwa watu walioathiriwa na zebaki wanapata madhara ya kupungua kwa nguvu za uzazi, kutetemeka, kupoteza kumbukumbu na saratani za aina mbalimbali.

"Kwenye sekta ya afya hasa katika uzibaji wa meno, kuna athari zaidi," anasema Mng'anya.

Ofisa Miradi wa Agenda, Haji Rehani anasema athari hizo hazionekani kwa wagonjwa tu bali hata madaktari wanaofanya kazi hiyo ya kuziba meno.

"Watoto kwa sababu bado wanakua, wao wakiziba meno kwa kutumia zebaki wanaathirika sana kwa sababu ikiingia kwenye mfumo wa damu inaua hata viungo vingine ambavyo vingemsaidia mtoto kukua.

Kwa mtu mzima akiziba meno kwa zebaki atapata athari kutokana na wingi wa meno atakayoyaziba, wengi wanapenda kutumia zebaki kwa kuwa inakaa muda mrefu, lakini madhara yake ni makubwa," anasema Rehani.

Anasema baadhi ya hospitali na vituo vya afya, vimeanza kutumia vifaa vya tiba mbadala vyenye Zebaki, kama vipima joto na vile vya shinikizo la damu, lakini bado vinaziba meno kwa kutumia mchanganyiko wa siliva na zebaki.

Anaeleza madaktari wengi wa meno wanaelewa athari za kuziba meno kwa kutumia madini hayo, pia wanajua mbadala ya madini hayo, lakini bado wanatumia mchanganyiko huo kutokana na urahisi wa bei.

Utafiti unasema madaktari wa hospitali za Serikali wanafahamu madhara ya vifaa vyenye madini ya zebaki, lakini wanalazimika kuvitumia kwa kuwa ndivyo wanavyoletewa. Kwa upande wa migodi, anasema huko athari ni kubwa kwani zebaki inayotumika katika maeneo hayo ni kubwa zaidi.

"Kwenye maeneo ya uchimbaji mdogo wa dhahabu, ilionekana kuwa kwenye maeneo ya kuchoma dhahabu, kiwango cha zebaki kwenye hewa kilikuwa kikubwa zaidi kuliko maeneo ya uoshaji na mengine.

"Kuna eneo tulikuwa tukifika na kupima inabidi tukimbie haraka kwa sababu kulikuwa na kiwango kikubwa cha zebaki. Katika maeneo haya waathirika siyo tu wale wanaochoma dhahabu, hata wale waliozunguka katika eneo husika wanaathirika," anasema Rehani.

Kutokana na hali hiyo, utafiti huo ulipendekeza kuwapo kwa juhudi za kuongeza zaidi ubadilikaji wa hewa ndani ya vyumba vya kuziba meno.

Pia madaktari wa meno wanatakiwa kuwashauri kwa ufasaha wagonjwa wao kuhusu madhara yanayosababishwa na zebaki wakati wa kuziba meno.

"Wizara na idara za Serikali wanapaswa kutafakari kwa kina kuhusu kubadili sera za manunuzi ya vifaatiba kwa kuangalia zaidi vifaatiba visivyokuwa na zebaki," anasema anasema Rehani.

Mapendekezo mengine yaliyotolewa kwenye utafiti huo ni kutaka kufanyika kwa tafiti zaidi ili kupata mbadala wa madini ambayo yatakuwa yanatumika kwenye uchimbaji wa madini wa dhahabu na kusambaza zaidi taarifa za teknolojia mbadala ya zebaki.

Jino

1. Madaktari wengi wa meno wanaelewa athari za kuziba meno kwa kutumia zebaki.
2. Mtu mzima akiziba meno atapata athari kutokana na wingi wa meno atakayoziba.
3. Watoto wanaathirika zaidi.

Source Mwananchi 05/03/2014

Source: Tanzania Daima 01.03.2014

Wanaoziba meno kwa madini hatarini

Na Nasra Abdallah

WAGONJWA wanaoziba meno kwa kutumia silva-zebaki, wameelezwa kuwa katika hatari ya kuathirika na madini hayo ambayo ni hatari kwa afya ya binadamu.

Ofisa Programu Mwandamizi wa Shirika la Mazingira na Kuwajibika kwa Maendeleo (AGENDA), Haji Rehani, alieleza hayo juzi alipokuwa akitoa taarifa ya utafiti wa viwango vikubwa vya zebaki kwenye hewa katika vitengo vya kuziba meno na wachimbaji wadogo wa dhahabu.

Alisema katika mikoa minne ambako utafiti huo umefanyika; Dar es Salaam, Mwanza, Geita na Mbeya, inaonyesha ipo haja ya kuacha kutumiwa kwa zebaki ukizingatia kwamba tayari nchi 90 duniani zimeshatia sahihi mkataba wa kimataifa unaosimamia matumizi yake.

Akifafanua kuhusu utafiti huo ambao umefadhiliwa na Shirika la Zero Mercury Working Group (ZMWG), Rehani alisema wamegundua katika vituo vingi vya afya na hospitali kubwa za serikali zebaki inatumika katika vifaa tiba pamoja na kuzibia meno.

Hata hivyo, alisema baadhi ya hospitali na vituo vya afya vimeshaanza kutumia vifaa tiba mbadala visivyo na zebaki, ikiwemo vipima joto na shinikizo la damu japokuwa bado wanaziba meno kwa kutumia mchanganyiko wa silva na zebaki.

Alizitaja sababu zinazochangia baadhi yao kupendelea kutumia mchanganyiko wa silva na zebaki kuwa ni kutokana na urahisi wa bei na wengine wanadai wagonjwa wenyewe wanapendelea kuzibwa meno na madini hayo.

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AGENDA: Mercury threat to dental clinics, artisanal miners

Patients and dental workers are at risk as they inhale a lot of mercury during the filling process

Miners lack mercury emissions reduction technologies

Dental mercury fillings

The Programe Manager for AGENDA, Haji Rehani (middle) presenting the report of the research. Left is the Project Coordinator for AGENDA, Silvani Mng'anya and right is Assistant Programe Manager. Picture by Sidi Mgumia

BY SIDI MGUMIA

While hundreds of Tanzanians opt for mercury dental fillings, a new report shows that high mercury exposure through air in the dental sanctions and small scale gold mining areas in Tanzania is alarming.

The report by Agenda for Environment and Responsible Development (Agenda), with support from Zero Mercury Working Group (ZMWG), carried out the study in Dar es Salaam, Mwanza, Geita and Mbeya regions.

According to Agenda Programme Manager Haji Rehani, the report highlights the urgent need for an overall reduction in mercury emissions as many governments of the world have signed the Minamata Convention (90 countries), and the processes for ratification are ongoing. Rehani said in the four regions, 21 healthcare centres were covered—including 12 hospitals and nine central elegies as well as 14 small scale gold mining centres.

"In most of health care centres, mercury is still in use in equipment, products and dental filling processes. Mercury exposure to patients and dental section's workers as well as medical equipment store keepers, is derived from mercury emissions from dental filling processes as well as leaking of mercury," he said

He added that mercury exposure to miners and nearby communities in small scale gold mining areas, gold amalgamation process using elemental mercury, as well as panning and burning of mercury-gold amalgam in an open air without recovery system.

Rehani noted that some of the hospitals, have phased out mercury containing equipment such as thermometer and sphygmomanometer and currently use alternatives, while still using silver-mercury amalgam for dental filling such as composite and glass incomer, but some of them prefer more silver-mercury amalgam due to its cheapness and some claim that many patients prefer amalgam more than other alternative.

"It was further found that, many dental doctors in government hospitals are aware of health impacts of mercury and are trying to avoid its use, even though silver-mercury amalgam is the

main dental filling material received from the medical supply chain," he said.

He insisted that due to limited information and awareness of working mercuty alternatives, small scale gold miners continue to use mercuty as their main gold recovery technique while there exists alternatives such as Borax methods and cyanide leaching for medium scale gold miners.

However, the measurements that were taken within the healthcare centres showed varied levels of mercury in the air. In the wards, damping sites and open spaces, mercury in the air was noted to be low, ranging from 4ng/m3 to 200ng/m3 while the amount of mercury found in the store rooms were high as many stores are closed with no ventilation hence low frequency of air exchanges.

"In the dental sections and dental clinics, mercury was noted to be moderate above the WHO limits in the facilities that have high ventilation with open big while mercury in the dental rooms seem to be very high during dental filling mercury amalgam filling.

This shows that patients and dental workers inhale a lot of mercury during filling while maximum allowable indoor exposure levels of mercury is 300ng/m3 (WHO-World Health Organisation)," he said

Rehani added that in small scale gold mining areas, it was also noted that in the burning areas mercury levels were too high comparing to amalgamation, washing and other areas.

The report also finds that the level shoot up to -50,000ng/m3 in burning areas hence demonstrate that people who are involved in the burning of amalgam process inhale a lot of mercury as well as nearby communities are also exposed to mercury fumes while unaware as higher levels of mercury were also found in the general open area near processing sites, that means even people who does not engage themselves in the mining process are still exposed to mercury.

Generally, it was observed that artisanal and small scale mining centres, showed highest levels of mercury and private dental hospitals came second, while Government dental hospitals were third.

According to Rehani, the study therefore, recommends that there is need to improve ventilation as well as frequency of air exchange in dental filling rooms. He said dental doctors should provide adequate advice on mercury health risks to dental filling patients.

Agenda Project Coordinator, Silvani Mng'anya, said ministries should consider changing their procurement policies in order to successful phase out mercury products and equipment by focusing on alternatives," he said

"Awareness creation on artisanal and small scale gold mining recovery technology and mercury emissions reduction technologies is shared among stakeholders," said Mng'anya

He added that more researches need to be carried out on mercury alternatives technologies for gold recovery and disseminations of best available technologies as well as best environmental practises of artisanal and small scale gold mining.

Mng'anya added that there should be more propagation to miners on existing mercuty alternative technologies for artisanal and small scale gold mining and gold recovery.

THE AFRICAN, MARCH 10-16, 2014

Mtanzania Newspaper of 20th March 2014

Na Sidi Mgumia, Dar es Salaam

UTAFITI unaonyesha kuwa kuna kiwango kikubwa cha zebaki kwenye hewa katika vitengo vya kuziba meno na maeneo ya wachimbaji wadogo wa dhahabu, ambacho kinayaweka hatarini maisha ya walio katika mazingira hayo.

Utafiti huo uliofanywa na Agenda for Environment and Responsible Development (AGENDA) kwa ufadhili wa "Zero Mercury Working Group (ZMWG) katika mikoa ya Dar es Salaam, Mwanza, Geita na Mbeya, uliwasilishwa na Meneja Mradi wa AGENDA, Haji Rehani.

Rehani anafafanua kuwa, utafiti huo unaonyesha uhitaji mkubwa wa kupunguza matumizi ya zebaki ili kuepuka madhara yake katika mazingira, jambo ambalo limeungwa mkono na watu wengi ulimwenguni.

Mpaka sasa nchi 90 zimeshatia sahihi Mkataba wa Kimataifa wa Minamata unaosimamia zebaki, wakati mchakato wa kuukubali ukiendelea.

Katika mikoa yote minne, jumla ya vituo 21 vya afya ambavyo vilihusisha hospitali 12 na vituo vya kuziba meno tisa, pamoja na maeneo ya wachimbaji wadogo wa dhahabu 14 vilifanyiwa utafiti kwa kutumia mashine aina ya 'Mass Spectrometer Mercury Analyster (Lumex RA 915).' "Katika vituo vya afya na hospitali nyingi, zebaki inatumika katika vifaa tiba pamoja na kuzibia meno. Wagonjwa pamoja na wahudumu wa idara za kuziba meno na wafanyakazi wa maghala ya kuhifadhi vifaa tiba wanaingiwa na zebaki mwilini kutoka kwenye vifaa tiba na mchakato wa kuziba meno au kutoa zebaki iliyozibia meno," anasema Rehani.

Rehani anaongeza kuwa wachimbaji wadogo wa dhahabu na jamii zinazowazunguka wanaingiwa na zebaki kutokana na mchakato wa ukamatishaji na uchomaji wa mbale (mchanganyiko wa dhahabu na zebaki) bila kutumia vifaa vya kukamata zebaki.

"Baadhi ya hospitali na vituo vya afya vimeshaanza kutumia vifaa tiba mbadala vyenye zebaki kama vipima joto, shinikizo la damu, lakini bado wanaendelea kuziba meno kwa kutumia mchanganyiko wa silva na zebaki," anasema. Anabainisha kuwa madaktari wengi wa meno wana ufahamu juu ya athari na mbadala ya kuziba meno na silva-zebaki kama kompositi (composite) na madini kioo (glass ionomer) lakini baadhi yao wanapendelea kutumia mchanganyiko wa silva-zebaki kutokana na urahisi wa bei na wengine wanadai kuwa wagonjwa wanapendelea kuzibwa meno yao kwa silva-zebaki kuliko mbadala.

Pia ilifahamika kuwa madaktari wa meno wa hospitali za serikali wanafahamu madhara ya zebaki lakini vifaa tiba wanavyoletewa kwenye hospitali zao ni vyenye silva-zebaki.

"Kutokana na kutopatikana taarifa sahihi na kwa urahisi za mbadala wa zebaki kwa wachimbaji wadogo wa dhahabu, wameendelea kutumia zebaki katika shughuli zao wakati kuna mibadala kama "Borax" na uyeyushaji kwa kutumia chumvi ya sayanaidi kwa wachimbaji wa kati," anasema Rehani.

Anasema utafiti uliofanyika kwenye hospitali mbalimbali ulionyesha viwango tofauti kwenye hewa kulingana na shughuli. Kwenye vyumba vya wagonjwa, maeneo ya kutupia taka na maeneo ya wazi yalionyesha viwango vya zebaki kati ya 4ng/m³ na 200ng/m³ wakati kwenye maghala ya kuhifadhi vifaa tiba ilikuwa juu kwa kuwa huwa vinafungwa muda mwingi hivyo hewa haibadiliki mara kwa mara.

Vyumba vya kuzibia meno vyenye madirisha makubwa yaliyo wazi yalionyesha viwango vya kati na yale yaliyofungwa na yenye mzunguko mdogo wa hewa yalikuwa na viwango vikubwa zaidi. Rehani anasistiza kuwa viwango vilikuwa vya kati wakati hakuna uzibaji meno na wakati wa uzibaji meno kwa kutumia silva-zebaki vilikuwa juu zaidi. Wakati wa uzibaji, viwango vya zebaki hufika mpaka 9,655ng/m³.

Hii inaonyesha ni kwa kiasi gani wagonjwa na wahudumu wa vitengo vya meno wanavyopata viwango vikubwa vya zebaki kwenye miili yao wakati kiwango cha juu kinachoshauriwa na Shirika la Afya Duniani (WHO) ni 300ng/m³.

"Katika maeneo ya uchimbaji mdogo wa dhahabu, ilionekana maeneo ya uchomaji mbale (mchanganyiko wa zebaki na dhahabu) kiwango cha zebaki kwenye hewa kilikuwa kikubwa zaidi ya maeneo ya ukamatishaji, uoshaji na mengineyo. Viwango vya zebaki vilikuwa vinazidi 50,000ng/m³ ambayo inaonyesha kuwa watu wanaoshughulika na uchomaji wanaongiwa na zebaki nyingi zaidi na wengine walio jirani bila kujitambua," anafafanua.

Akizungumzia hali iliyoko hivi sasa dhidi ya madhara ya zebaki, Msimamizi wa Mradi AGENDA, Silvani Mng'anya, anasema kwa ujumla, ilionekana kuwa maeneo ya uchimbaji mdogo wa dhahabu ulionyesha viwango vya juu zaidi ukifuatiwa na hospitali za meno za binafsi na za serikali. "Utafiti umependekeza kuwapo kwa juhudi za makusudi ili kuongeza zaidi ubadilikaji wa hewa ndani ya vyumba vya kuzibia meno pia madaktari wa meno wawashauri kwa kina wagonjwa wa meno kuhusu madhara ya zebaki kiafya," anasema Mng'anya.

Anasema wizara na idara za serikali zinahitajika kutafakari kwa kina kuhusu kubadili sera za manunuzi ya vifaa tiba kwa kuangalia zaidi vifaa tiba visivyo na zebaki.

Mng'anya anasema pia kunahitajika kuwaongezea uelewa wachimbaji wadogo wa dhahabu na wadau wengine kuhusu mbinu na teknolojia mbadala ya zebaki ili kuhakisha suala hili linashughulikiwa kwa nguvu zote.

Rehani anashauri tafiti ziendelee kufanyika zaidi kuhusiana na mibadala na teknolojia muafaka (Best Available Technologies) pamoja na taratibu bora (Best Environmental Practices) kutumika kwenye uchimbaji mdogo wa dhahabu. Pia inahitajika kusambaza zaidi taarifa za teknolojia mbadala wa zebaki muafaka kwa wachimbaji wadogo wa dhahabu kuhusiana na ukamataji wa dhahabu.

Meneja Mradi wa AGENDA, Haji Rehani (katikati) akiwasilisha ripoti ya utafiti iliyofanywa dhidi ya madhara ya zebaki katika baadhi ya maeneo nchini.

ANNEX 6: LINK TO RADIO INTERVIEW

http://www.kiswahili.rfi.fr/afya-mazingira/20140304-madhara-ya-kutumia-madini-ya-zebaki-kwa-kusafisha-meno

ANNEX 7: PHOTOS

Photo set 1: Mercury level measurement in the healthcare centres and dental clinics

Photo set 2: Mercury level measurement in the small scale mining

Photo set 3: Mercury level measurement in the dumping sites