Lessons from mercury dental amalgam phase down for developing economies.

[1]Arotiba G.T., [2]Loto A.O., [1]Ijarogbe O., [1]Ajayi Y., [2]Menakaya I., [1]Umesi D. C., [3]Adogame L.

[1]Faculty of Dental Sciences, College of Medicine, University of Lagos, PMB 12003, Lagos Nigeria.
[2]Faculty of Dentistry, College of Medicine, Lagos State University, Ikeja, Lagos.
[3]Sustainable Research and Action for Environmental Development (SRADEV), Ikorodu Road, Lagos Nigeria.

ABSTRACT

This paper highlighted six pertinent issues that developing economies should focus on with regards to mercury dental amalgam phase down. The need to set up structures for monitoring and evaluation of materials and technologies used in clinics, laboratories and hospitals was discussed as well as the need to provide research data on mercury pollution that may be peculiar to developing economies. The urgent needs to update dental schools' curricula and update the training of general Dental practitioners were also discussed. A framework for curriculum development, review and update was proposed using the Minimum Intervention Treatment Plan (MITP). Two other caries management pathways-the International Caries Classification and Management System Caries Management Pathway (ICCMS-CaMP) and the Caries Management by Risk Assessment (CAMBRA-CaMP) were also highlighted. A "frog-leaping' phase down approach was proposed that took cognizance of the poor infrastructure for waste management in developing economies. Opportunities for new oral health policy initiatives with regards to integration of oral health into national and international health agenda were also discussed.

Keywords: Mercury, dental amalgam, phase down, lessons, curriculum update.

INTRODUCTION: In June, 2014, Colgate sponsored a one-day meeting on current caries research and management for deans of Dental Schools in Nigeria during the International Association for Dental Research (IADR) conference in Cape Town, South Africa. Professors Nigel Pitts of King's College London and Amid Ismail of Temple University, USA were the main speakers. This meeting was held under the auspices of the Alliance for a Cavity Free Future (ACFF). It highlighted advances in caries research, caries management pathways and principles of minimum intervention dentistry. It is noteworthy that Profs Pitts and Ismail with Dr Marisol Tellez subsequently published the International Caries Classification and Management System (ICCMS), an example of a caries management pathway in Biomed

Correspondence : Arotiba G. T.
Immediate Past Dean,
Faculty of Dental Sciences,
College of Medicine,
University of Lagos,
PMB 12003, Lagos, Nigeria
gtarotiba@gmail.com
Tel: 0803 752 0961
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Central in 2015[1]. The Abuja declaration on mercury free dentistry for Africa was held on October 13th 2014. On 22nd February, 2016, World Alliance for Mercury Free Dentistry (WAMFD), Sustainable Research and Action for Environmental Development (SRADev) Nigeria and the Nigerian Dental Association organized a one-day workshop on phasing down of mercury dental amalgam in Lagos Nigeria. In June 2016, the Faculty of Dental Sciences College of Medicine, University of Lagos marked its 50th anniversary with its annual scientific conference. The theme of the conference was 'Phase down of mercury dental amalgam –the alternatives'. A road map for phase down of mercury dental amalgam in Nigeria was developed. In May 2018, the United Nations in partnership with the World Alliance for Mercury Free Dentistry organized a two-day workshop on mercury- free Dentistry in Bangkok, Thailand. The theme of the workshop was "Promoting Dental Amalgam Phase Down Measures Under the Minamata Convention and Other Initiatives, for Women, Children, and Future Generations. There were participants from Europe, Asia, North America, South America, Middle East and Africa (Fig. 1). Far reaching recommendations were made by the regional discussion panels[2]. This paper will highlight critical lessons for developing economies from

down. It will also propose a 'frog-leaping' phase down approach for poor developing economies, a framework for mercury-free Dentistry (Minimum Intervention Dentistry) curriculum development, review, update and evaluation. It will also highlight opportunities for new oral health policy initiatives.

Figure 1:
Participants from Asia, Africa, Europe and the Americas at the United Nations/World Alliance for mercury Free Dentistry workshop held in Bangkok, Thailand (May, 2018).

Minamata disease and Minamata Convention on Mercury

Minamata disease is a neurological syndrome caused by severe mercury poisoning. Symptoms include ataxia, numbness in the hands and feet, general muscle weakness, narrowing of the field of vision and damage to hearing and speech. In extreme cases, insanity, paralysis, coma, and death follow within weeks of the onset of symptoms. [3]

A congenital form of the disease can also affect fetuses in the womb. It was discovered in Minamata city in Kumamato prefecture, Japan in 1956. It was caused by the release of methylmercury in the industrial wastewater from the Chisso Corporation's chemical factory. In March 1958, visiting British neurologist Douglas McAlpine suggested that Minamata symptoms resembled those of organic mercury poisoning . [3]

The Minamata text was adopted in 2013 in Japan. This agreement entered into force on 16th August 2017.The main objective was "to protect the human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds [4].

In Part II of the Convention's Annex A, parties are to take measures to phase down the use of dental mercury amalgam. As stated in the Convention's preamble, this includes awareness "of health concerns, especially in developing countries resulting from exposure to mercury of vulnerable populations, especially women, children and future generations [4].

Measures to be taken by a party to phase down the use of dental amalgam shall take into account the party's domestic circumstances and relevant international guidance and shall include two or more of the measures from the following list: [4]

(I). Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration;

(ii). Setting national objectives aiming at minimizing its use;

(iii). Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration;

(iv). Promoting research and development of quality

mercury-free materials for dental restoration;
(v).Encouraging representative professional organizations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices;
(vi).Discouraging insurance policies and programs that favor dental amalgam use over mercury-free dental restoration;
(vii).Encouraging insurance policies and programs that favor the use of quality alternatives to dental amalgam for dental restoration;
(viii).Restricting the use of dental amalgam to its encapsulated form; and
(ix).Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.

Ecotoxicity and Human Toxicity of Mercury Dental Amalgam

Most of the mercury in dental amalgam used in dental clinics end up in the environment through the solid (municipal or harzadous) waste and waste water streams. From the patient who has amalgam fillings, the pathway to the environment includes: through cemetery to soil and ground water; through crematorium to the atmosphere and through the toilets to waste water treatment. In summary, when dental amalgam is used, mercury will be released to the air, water and land, and some of it will eventually be taken up in fish and other living things, including humans[5-7]. Inorganic Hg (from natural or anthropogenic sources) becomes toxic in the environment when it is converted to methyl mercury (MeHg) by sulphur-reducing bacteria and other microbes[8].

Methyl mercury (MeHg) is a potent neurotoxin that can cause physiological, neurological, behavioural, reproductive, etc. harm to fish and wildlife. [8] It is also an efficient biomagnifier, resulting in increasing concentrations of MeHg in the ecosystem as it moves from water and sediment, to phytoplankton and plants, aquatic insects, spiders, fish and wildlife. [8] Certain ecosystem conditions (e.g. wetlands) can encourage the production and bioavailability of MeHg. [8]

Occupational and patient exposure

Direct human mercury exposure can occur through hand-mixing of mercury and metal powders; drilling of old amalgam fillings; extraction of teeth with amalgam and solid waste disposal bins. It can also occur through slow release of mercury from fillings already in place in the mouth and emissions into the clinic from clinic wastewater system. Mercury has been reported to be able to pass through latex gloves [5-7]

Effective Phase down Steps and Deliverables at the Bangkok workshop.

The African group discussion panel proposed the following eight effective phase down steps: [2]

1. Update dental school curricula to train Dentists in mercury free Dentistry (minimum intervention dentistry);
2. Educate consumers and parents that dental amalgam is half mercury and that non-toxic alternatives exist;
3. Modify insurance coverage to favor mercury free alternatives;
4. Modify government programs to favor mercury free alternatives;
5. Adopt a time line for the non-use of mercury dental amalgam for children;
6. Adopt a time line for non-use of mercury dental amalgam for pregnant and breast feeding women;
7. Promote the non-use of mercury dental amalgam in stand-alone healthcare delivery systems such as hospitals and the armed forces etc; and
8. Stop the inflow of mercury dental amalgam from other countries and international donor agencies.

The following five deliverables were also proposed:

1. Updating dental school curriculum;
2. Engaging dental professional groups and bodies;
3. Encouraging insurance practices that favor mercury free restorations;
4. Engaging manufacturers and dealers; and
5. Phase out in vulnerable groups.

20th Century Dentistry ('Drill and Fill' Dentistry)

Twentieth century dentistry was characterized by the "drill and fill" approach to the management of dental caries. This was probably because there was a very simplistic understanding of the etio-pathogenesis of the caries process. Traditionally, caries was attributed to an interplay of four factors namely, a susceptible host, microflora, diet and time. This resulted in the treatment of the manifestation of the disease (cavity)

rather than the cause of the disease. Epitomizing this era was GV Black's classification of caries and his principles of cavity preparation (extension for prevention, undercuts for retention, sharp internal line angles, cavo-surface line beveling etc.). This is the so called 'surgical' or 'engineering' approach to caries management. Some have also attributed this approach to the historical emergence of dentistry from surgery[9-11] The end result of this approach to caries management is the eventual loss of the tooth (the 'restorative cycle spiral')[12].

This "engineering" or "surgical' approach was not without some caution from 3 leading lights of 20th century caries management. Magitot in 1886 admonished dentists to shift focus from cavity that must be filled to detecting the early stages of the caries process. Furthermore, GV Black in 1910 and Gies in 1912 also warned that dentistry should not embrace its technological base at the expense of its biological foundations. However, the 'drill and fill' approach to caries management persisted well into the twenty first century[10,11].

21st Century Dentistry (Minimum Intervention Dentistry - MID)

It became obvious gradually that the "drill and fill" approach to caries management led to eventual loss of the tooth. There were early scientific findings which pointed to better approaches to caries management which were poorly understood, interpreted and ignored (for example the publications of Dirks et al 1961[13] , Massler 1967[14], Mount 199115[15] , Dawson and Makinson 1992[16], Fusayama 1997 [17] and Anusavice, 1998 [18]).

One land mark research which shaped further development of 21st century caries management was reported by ten Cate in 2001.[19] He reported the remineralization of caries lesion extending into dentine and emphasized Kidd's far sighted principle of 21st century caries management - "Restorative treatment should be delayed to provide maximum possibilities for lesion repair and arrest.' [19]

The evolution of caries management pathways (CaMPs)

Cariology researchers having now correctly interpreted the results of the emerging 21st century caries research, constituted themselves into groups to implement new approaches to caries management. They now heeded Magitot's admonition to study early caries lesions and developed caries staging systems with prevention focused treatment recommendations based on the stage of the disease. Two of such systems stood out: American Dental Association Caries Classification System (ADA CCS)[20]and the International Caries Diagnosis and Assessment System (ICDAS) – first reported by Nigel Pitts in 2004[2]. The cariogram an interactive computer based program for patient education and motivation was developed by University of Malmo in Sweden in 2002.[22] Further refinements led to the development of 3 major caries management pathways (CaMP): Caries management by risk assessment (CAMBRA) by Featherstone et al. in 2002[23] caries management System (CMS) by Evans RW et al. in 2008[24] and Minimum Intervention Treatment Plan (MITP) by GC Europe MID Advisory Board in 2009.[25]

In May 2012 cariologists, dentists, representatives of dental organizations, manufacturers and third party payers from several countries met in Philadelphia, USA with a view to harmonize the goals and strategic approaches to caries management in the 21st century. [1] The objective was to stimulate changes in academia, clinical practice and public health to reflect the new emerging scientific evidence on caries management. CAMBRA, MITP and CMS groups participated actively in the proceedings. The participants agreed on a new mission for all caries management approaches: 'To preserve tooth structure and restore only when necessary[1]. The workshop also recommended continuing management of the etiological factors of caries and the use of evidence-based preventive regimens to prevent recurrence and re-restoration. The workshop admonished all oral health professionals to "focus on the promotion of oral health and the preservation of sound tooth tissue rather than counting the number of surgical-restorative procedures performed.' [1]

The International Caries Classification and Management System (ICCMS) was eventually published in 2015 by Ismael et al. [1] It is noteworthy that both GC Europe Minimum Intervention Treatment Plan (MITP) [25] and ICCMS [1] Caries Management Pathway (CaMP) adopted a modified ICDAS [21] caries staging system.

Minimum Intervention Dentistry (MID)

The results of 21st century cariology research have led to the emergence of the philosophy of minimum

intervention dentistry (MID). The first International Dental Federation (FDI) report on minimum intervention dentistry was published in 2000 by Tyas et al.[26] This was immediately adopted by GC Corporation (Japan and Europe)[27]. In partnership with the International Dental Federation (FDI) and International Association for Dental Research (IADR) workshops were held in 2004 in Hawaii and in 2005 in Baltimore (both in USA)[27]. This culminated in the formation of GC Minimum Intervention Dentistry Advisory Board (consisting of dentists in general practice, researchers and academics) in 2007. The international symposium on MID was held in Stockholm, Sweden in 2008[27]. The challenge had been the slow implementation of this philosophy in general dental practice and in dental education.

Walsh and Brostek defined MID as "a philosophy of caries management that is focused on risk assessment of individual patients; early detection of oral disease, targeted preventively oriented strategies and limited surgical intervention related to the level of disease[28].

GC Europe MID Advisory Board defined Minimum Intervention Dentistry as "a holistic, patient-centered, evidence based approach to caries management with preservation of healthy tooth tissue" and presented a simple 4 phased approach to implementing MID in general dental practice- the Minimum Intervention Treatment Plan (MITP) in 2009 [25,27] (Fig 2): M I Identify (risk factors);M I Prevent (risk factors from re-occurring);M I Restore (minimally invasive techniques); andMI Recall (risk adjusted recall).

The definitive guide to MID – the GC Europe MID handbook was published in 2017. [27] A fifth dimension was introduced to the MID equation by the ICCMS group in their publication by Ismael et al in 2015; an oral health outcome assessment based on health promotion, disease control and patient centered quality metrics[1]. The ICCMS-CaMP MID approach has 5 essential components: [1]Determine (patient level caries risk);Detect and Access (caries staging and activity); Decide (personalized care plan, patient and tooth level); Do (tooth & patient preserving caries prevention and control interventions- management); and oral health Outcome assessment (Health promotion, disease control and patient centered metrics).The CAMBRA-CaMP has 4 components[23]: Risk assessment; Diagnosis of the caries disease process (History etc.);Restorative treatment with MID principles; and Recall (risk based). Any of the 3 major CaMPs can be modified and adopted for dental practice and dental education in developing economies.

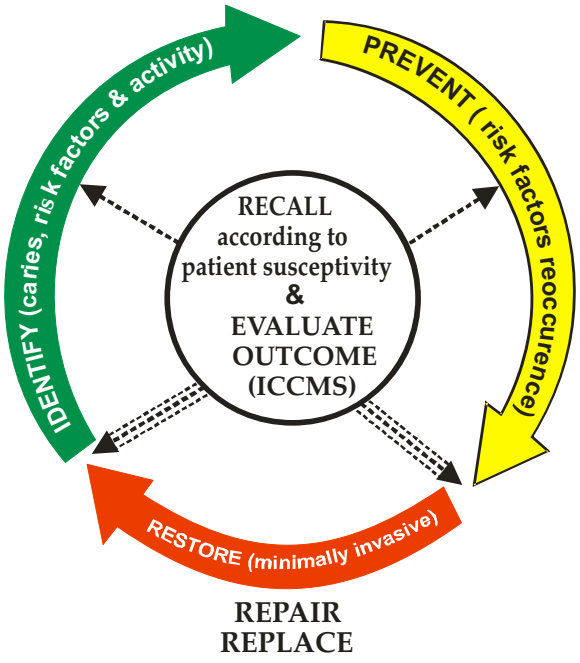

Figure 2: The color-coded Minimum Intervention Treatment Plan Cycle (adapted from Bassu et al. [27])

Lessons from mercury dental amalgam phase down

Lesson 1: A frame work for monitoring and evaluation of all technologies and materials used in a clinical setting is urgently required. The significant contribution of mercury dental amalgam to global ecotoxicity and human toxicity should alert the dental and other healthcare professions to the need to regularly monitor and assess the occupational and environmental impact of all materials and technologies used in our clinics, laboratories and hospitals. To effectively do this, collaborations with toxicologists, pharmacologists and other biomedical professionals will be required. The cooperation of waste disposal experts and environmental health experts will also be essential. Relevant government agencies will need to establish a framework for regular monitoring and evaluation of clinics, hospitals and laboratories.

Lesson 2: The Training of 21st Century Dentists

Modern dentists will need to be knowledgeable not only in oral and general health, but also in occupational health issues that may arise in the dental clinic environment that may affect dentists, other dental staff and patients. In addition, modern dentists should be knowledgeable in environmental pollution issues that affect our planet and human health. In this regards the curriculum for training dentists globally and in particular in poor developing economies will need to be updated at virtually all levels of training. Our suggestions for curriculum development, review, update and evaluation will require the introduction of new courses at virtually all levels of a typical 6 years Bachelor of Dental Surgery programme as follows:100 level (1st Year)

Introduction to Environmental sciences (Our Planet); and introduction to environmental pollution : 300 level (3rd Year) Introduction to Toxicology (pharmacology): 400 level (4th Year): Mercury pollution and Dental Amalgam, Cariology I (Basic Cariology),Minimum Intervention Dentistry Operative Techniques (MIDOPT), Atraumatic Restorative Therapy (ART). 500 and 600 Levels (5th& 6th Years) Cariology II (Advanced Cariology); ICDAS [21] and Cariogram[22];CAMBRA [23] and CMS [24]; and MITP [25,26] and ICCMS [1]Toxicology of dental restorative materials: Minimum Intervention Dentistry in Clinical Practice I (CAMBRA-CaMP): Minimum Intervention Dentistry in Clinical Practice II (GC Europe MITP): Minimum Intervention Dentistry in Clinical Practice III (ICCMS-CaMP): The Safe Mercury Amalgam Removal Technique (S. M. A. R. T.) as recommended by the International Association of Oral Medicine and Toxicologists (IAOMT)[29] and Ceramics.

Simulation laboratory instructions should be conducted with mercury free restorative materials based on the operative principles of MID. There is an urgent need to design new teaching models that will be focused on teaching the basic principles of minimal intervention dentistry operative techniques at the pre-clinical dentistry level (400 level) of the BDS curriculum. It logically follows that all simulation laboratory and clinical training and requirement activities should be conducted with mercury free dental restorative materials. There is an urgent need for all dental schools to embrace mercury free dentistry (Minimum Intervention Dentistry) without delay. Do we still need to ask our students to restore specified numbers of GV Blacks caries cavities in the 21st century? The obvious answer is no. This is because with MID, the student will only need to present specified number of patients managed holistically with MID principles which is focused on early caries diagnosis, caries risk and activity assessment (CRAA), re-mineralization therapies, frequent recall visits and minimally invasive restorations. The student should be evaluated based on the 4 phases of MID as proposed by GC Europe MID Advisory Board [25,27] or the 5 phases of the ICDAS-ICCMS-CaMP [1] The 4 phases of the MITP; the 5 phases of ICCMS; or the 4 phases of CAMBRA can be easily adapted for dental education purposes by dental schools in developing economies. Furthermore, rather than counting the number of cavities restored or the number of procedures performed, assessments should be tailored to evaluating holistic management of the patient through all the phases of MITP: [25,27]

MID Identify-anamnesis for MID; the role of saliva in MID;Caries risk and activity assessment MID Prevent-Oral hygiene; dietary and caries counselling; minimum intervention dentistry prevention strategies I (low risk); minimum intervention dentistry prevention strategies II (high risk). MID Restore - Minimum Intervention Dentistry Restore/Repair/Replace; the safe removal of amalgam technique MID Recall / Oral health outcome evaluation- the role of the Dental Team in MID; the Business of MID; effective Clinical communication skills in MID; oral health outcome evaluation (ICCMS-CaMP criteria) The 5 phases of the ICCMS caries

management pathway [1] and the 4 phases of CAMBRA-CaMP can be similarly adopted and modified for students training and assessments. [23]

Competency examinations for both simulation laboratory and clinical training phases should be designed to reflect the principles of MID and be conducted using modern biomimetic/bioactive restorative materials (mercury free) materials.

We predict that MID philosophy will have a global impact on all phases of curriculum development, review, update and evaluation. Dental faculties in developing economies should move swiftly to integrate MID into their curriculum (Fig 3).

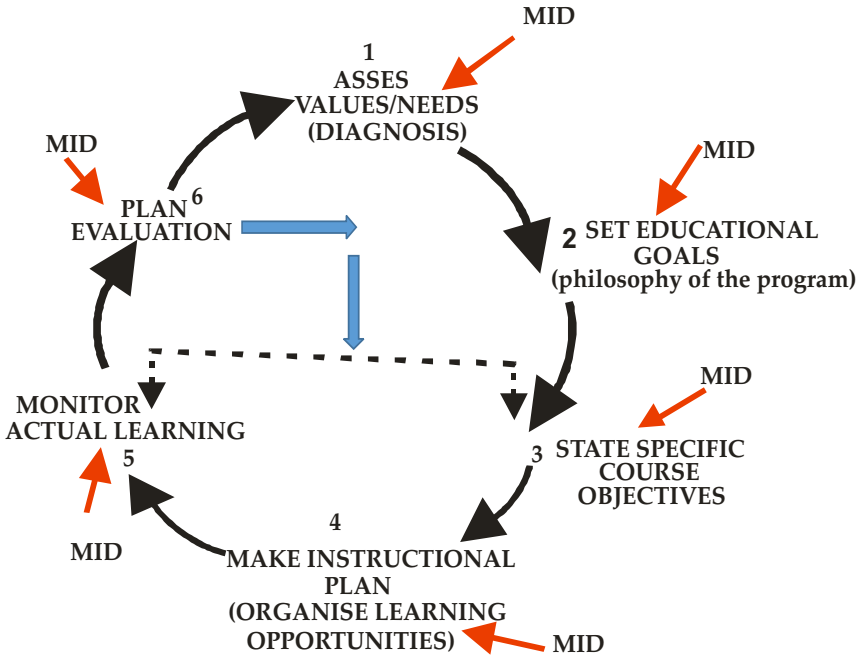

Figure 3: The curriculum development cycle (The planning cycle)- Illustrating the all-embracing influence MID philosophy will have on curriculum development, review, update and evaluation.

The Minamata convention provides for "Promoting research and development of quality mercury free materials for dental restorations[4]. It should be noted that dental material science units in the faculties of dentistry in developing economies are usually poorly staffed. These units should be strengthened by the employment of young lecturers who will be sponsored for further training at Masters/PHD levels at reputable institutions abroad. Universities and relevant government units need to source for funds for the training of young lecturers/researchers in dental material science. Obviously if the faculties of dentistry are to successfully transit from 'drill and fill' dentistry to minimum intervention dentistry, their simulation laboratories will need to be upgraded with modern ICT facilities with Teacher's simulation station (with voice and video recording facility) and interactive smart boards for e-learning. Fig 4.

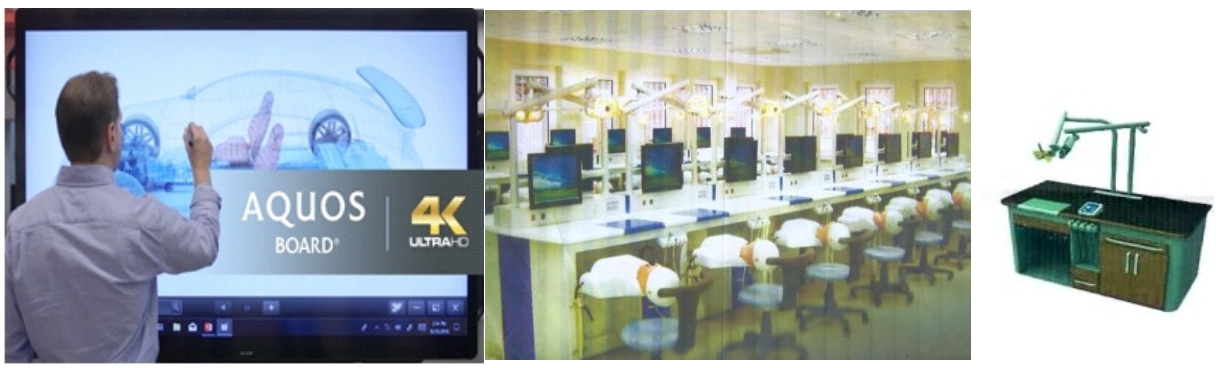

Fig. 4: E-learning enhanced simulation laboratory with interactive smart board, computerized simulation laboratory and teacher's simulation station with voice and video recording facility.

Furthermore, they will need funds to subsidize student's consumables as the new biomimetic /bioactive restorative materials are more expensive than mercury dental amalgam. Funding to support the faculties of dentistry should be harnessed from the following sources: [2]GEF funding component of the Minamata convention; the World Health Organization funding window for mercury amalgam; and government agencies of respective countries through some counterpart funding mechanism.

Lesson 3: Retraining of General Dental Practitioners. General dental practitioners in developing economies will also need to be reoriented to practice minimum intervention dentistry. Regular continuing professional development (CPD) courses with hands on are essential. Dental faculties should take the lead in organizing and promoting minimum intervention dentistry in general dental practice by organizing relevant CPD courses in their respective countries. In this regard there will be need to collaborate with experts from Europe, United Kingdom, Australia and USA. The CPD courses should be similarly structured to any of the three CaMPs - the MITP, ICCMS-CaMP or CAMBRA-CaMP[1,23,25,27]. An e-learning enhanced simulation laboratory with interactive smart boards, ICT and Teacher simulation stations (Fig. 4) will facilitate continue professional development (CPD) courses by the faculties of dentistry and enable general dental practitioners even in remote locations to have access to MID training without being physically present at the faculties.

Lesson 4: Mercury Free Dentistry Research

There are few research reports related to mercury free dentistry from Africa. Virtually all the researches on mercury dental amalgam pollution and its effect on human health have been conducted in developed economies. Faculties of dentistry should lead the way in this regards and provide relevant data that may be peculiar to our socio-economic situation. Focus areas for such research should include the following: dental clinic waste handling and disposal methods; urinary levels of mercury in dental clinic personnel and dental students; cariology teaching in undergraduate curriculum of dental schools in Sub-Saharan Africa; integration of MID into undergraduate curriculum of dental schools in sub-saharan Africa; use of local materials for the development and manufacturing of dental materials; mercury level in seafood (fish, crayfish, crabs etc.); mercury level in lakes and fish ponds; and the teaching of posterior composites in dental faculties.

Lesson 5: A 'frog-leaping' phase down strategy for developing economies. All stakeholders in poor developing economies should be involved in mercury amalgam phase down public awareness campaigns. Developing economies are obviously disadvantaged because of poor resources or mismanagement of these resources when available. This is responsible for the slow pace of efforts to phase down mercury dental amalgam (mercury dental amalgam is still widely used in these countries). Typically, there is lack of or poor infrastructures for waste management. Few have an organized system for sorting and disposal of medical waste and few have the required mercury stabilization plants. Furthermore, in poor developing economies amalgam separators are rarely installed in private dental clinics and faculties of dentistry. A recent survey by Leslie Adogame revealed high levels of mercury pollution in selected private clinics and faculties of dentistry clinics and simulation laboratories in Nigeria[2]. The question is should there be widespread installation of amalgam separators in poor developing economies with poor infrastructure for waste management? The obvious answer is no. This is reinforced by the fact that amalgam separators have been reported not to be 100% effective as mercury emissions have been reported in Dental clinics despite the use of separators. [30] Obviously, separators have little effect on the emission of mercury vapors. Developing economies should therefore move swiftly from phase down to phase out if they are to protect the environment and human health from mercury amalgam pollution from dental clinics. In this regards, a 'frog-leaping' phase down approach is hereby proposed for poor developing countries. It is well known that developing economies 'frog-leaped' to widespread use of mobile phone technology without the widespread installation of land lines. [2] They should also be encouraged to move speedily from phase down to phase out without investing in costly amalgam separators. This is the basis of the 'frog- leaping' strategy down approach (Fig 5). This should however, not be an excuse for not planning to develop the required waste disposal infrastructure to be adequately prepared for other environmental pollution issues that may arise in the near future. The Swedish chemical agency model (www.kemi.se) is strongly recommended. [2]

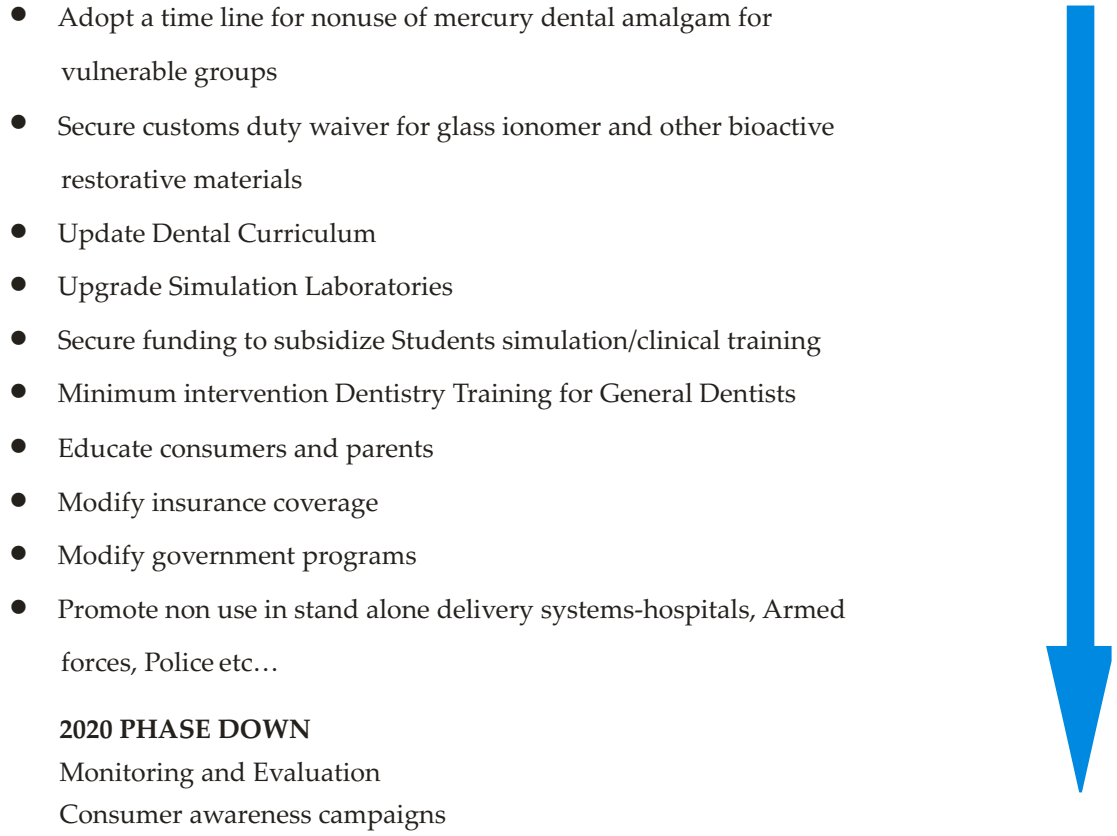

Fig 5: The proposed framework for the 'frog-leaping' strategy for phase down of mercury dental amalgam for developing economies.

Lesson 6: A platform for new Oral Health Policy Initiatives.

Dental caries is one of the most prevalent diseases worldwide with 91% of adults in industrialized countries experiencing caries in their life time[31]. Eke et al[32] reported that 70.1% of adults in USA of age 65 and above have periodontal disease. Untreated dental caries in permanent teeth was reported as the most prevalent of the 328 conditions assessed in 2016 Global Burden of Disease study[33]. It is therefore surprising that oral health is often neglected in the global health agenda[33]. In 2007, the World Health Organization (WHO) called for oral health integration into policies for prevention and treatment of chronic non-communicable and communicable diseases, and into maternal and child health policies[34]. This is because non-communicable diseases (cardiovascular diseases, cancer, diabetes and respiratory diseases) and oral diseases (periodontal diseases, caries and oral cancer) have common risk factors (sugar, tobacco, alcohol and poor diet). The 2030 agenda for sustainable development goals (SDG) has 17 goals with goal 3 focused on ensuring healthy lives and promoting well-being for all ages[35]. Target 3.8 of the universal health coverage (UHC) emphasizes the importance of all people and communities to have access to quality health services without risking financial hardship. [35] Essential agenda closely linked to effective implementation of the SDG agenda are health systems strengthening and Workforce 2030. [36,37] It is the duty of all oral health personnel to actively participate and ensure integration of oral health into all such national and international developmental agendas. The basic package of oral care (BPOC) [38] should be integrated into all non-communicable and communicable disease programs as well as into all maternal and child health programs at the primary care level. The major limitation will be the inadequate number and poor distribution of dentists in developing economies. Therefore, there will be need to train other cadres of oral health workforce in simple diagnostic, preventive and atraumatic restorative technique (ART) procedures. These new oral healthcare workforces should however be under the control and supervision of dentists who will regularly appraise their work. There should also be penalties for practicing outside the established guidelines.

Conclusions

Fisher et al submitted "that making progress towards UHC requires governments to have mechanisms to effectively manage oral health workforce planning, and to commit to mobilize and sustain adequate public funding for oral health, including budgetary resources for phasing down mercury dental amalgam[33] National oral health care policies should be reviewed to integrate oral health (BPOC and MID) into all programs for SDGs, Workforce 2030, Healthcare strengthening, non-communicable and communicable disease control, child and maternal health activities. Our governments need to move swiftly to ban the importation of mercury dental amalgam and remove or reduce customs duties and taxes on glass ionomer and other biomimetic/ bioactive restoratives. They should also increase public awareness campaigns of the detrimental effects of mercury in amalgam restorations through posters and banners and public lectures in public hospitals. The dental faculties and the dental profession in developing countries need to move swiftly and take leadership role in phase down of mercury amalgam efforts. They should also ensure the integration of MID into all curriculum development, review, update and evaluation activities. In addition, they should collaborate with experts in organizing CPD courses for general dental practitioners.

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