East African Medical Journal Vol. 101 No. 11 November 2024
DENTISTS' COMMITMENT-TO-CHANGE FOLLOWING A PROFESSIONAL DEVELOPMENT TRAINING ON DENTAL AMALGAM PHASE DOWN: BARRIERS TO IMPLEMENTATION OF RESTORATIVE PRACTICE CHANGES

Bernina Kyale Kisumbi, BDS (Nbi), MPhil (UK), Unit of Conservative and Prosthetic Dentistry, Department of Dental Sciences, University of Nairobi. P.O Box 19676, 00202, Nairobi, Kenya. Senior Lecturer Department of Dental Sciences, Loice Warware Gathece, BDS (Nbi), MPH (Nbi), PhD (Nbi), Unit of Periodontology/Community and Preventive Dentistry, Department of Dental Sciences, University of Nairobi. P.O Box 19676, 00202, Nairobi, Kenya. Professor Department of Dental Sciences, Olivia Awino Osiro, BDS (UON) MSc (Dent. Mater.) (Lon), Cert. Appl. Biostats. (UW), PhD (Biomater. Sci.) (Nbi), Unit of Conservative and Prosthetic Dentistry, Department of Dental Sciences, University of Nairobi. P.O Box 19676, 00202, Nairobi, Kenya. Senior Lecturer Department of Dental Sciences, Susan Wangui Maina, BDS (UON) MSc (CALIF), MSc (UK), PhD (UON), Unit of Conservative and Prosthetic Dentistry, Department of Dental Sciences, University of Nairobi. P.O Box 19676, 00202, Nairobi, Kenya. Associate Professor Department of Dental Sciences,

Corresponding author: Bernina Kyale Kisumbi, BDS (Nbi), MPhil (UK), Unit of Conservative and Prosthetic Dentistry, Department of Dental Sciences, University of Nairobi. P.O Box 19676, 00202, Nairobi, Kenya. Senior Lecturer Department of Dental Sciences. Email: bkisumbi@uonbi.ac.ke

DENTISTS' COMMITMENT-TO-CHANGE FOLLOWING A PROFESSIONAL DEVELOPMENT TRAINING ON DENTAL AMALGAM PHASE DOWN: BARRIERS TO IMPLEMENTATION OF RESTORATIVE PRACTICE CHANGES

B. K. Kisumbi, L. W. Gathece, O. A. Osiro and S. W. Maina

ABSTRACT

***Objective*: To evaluate dentists' commitment to change towards dental amalgam phase down following implementation of an online continuous professional development training.**
***Design*: Descriptive cross-sectional survey.**
***Setting*: The 47 counties of Kenya.**
***Participants*: Dentists registered to practice in Kenya**
***Interventions*: Implementation of an online training programme on dental amalgam phase down.**
***Main outcome measures*: Descriptive summaries of self-reported commitment to change statements, level of implementation of the committed changes and challenges experienced in implementation.**
***Results:* Out of the 216 participants 147 (68.1%) indicated commitment to change (CTC) certain aspects of their practice, and all responses (100%) were aligned to dental amalgam phase down (DAPD). Overall, the total number of commitment statements were 434, mean 2.95 and range 1-6. The most committed intended change was "*Use alternative restorative materials most of the time*". About a third 46 (31.3%) reported the status of implementation of the committed practice changes**

at three months. A total of 130 (30.0%) commitment reflections were submitted, the most frequent was "*partially implemented*" 66 (50.8%), whereas the least was "*fully implemented*" 31 (23.8%). Among those who committed to change, a majority 92 (62.6%) indicated challenges in implementation. Of these, 38 (41.3%) were hindered by inadequate funding, while a minority 4 (4.3%) faced lack of knowledge.

Conclusion: **Majority of the participants committed to change aspects of their operative practice and all responses were aligned to DAPD. At three months, the most commitment reflection was partial implementation, while inadequate funding posed the greatest challenge to intended changes.**

INTRODUCTION

Dental amalgam (DA) is an alloy of mercury with silver, tin and copper which has been in use for more than 150 years. Dentists triturate liquid mercury and alloy powder to fill cavities in posterior teeth, however, the lack of best waste management practice makes DA contribute to the worlds' anthropogenic mercury release. The Minamata convention on mercury (MCM) is a global treaty which was signed in 2013, it aims at reducing emissions anthropogenic pure mercury and mercury containing products including, dental amalgam.[1] It embodies phase out of mercury containing products and dental amalgam phase down (DAPD). DAPD is gradual reduction in the use of dental amalgam, embracing dental caries prevention and increasing the use mercury-free alternative restoratives. As virtually all countries implement DAPD albeit at different rates, it has culminated into a profound shift from the restorative philosophy based on the use of dental amalgam. This has ushered, a preventive and minimally intervention dentistry which principally employs adhesive dental amalgam alternatives for posterior fillings leaving the dentists with a challenge to stay abreast with the latest biomaterials and techniques.[2]

Kenya became a party to the convention in September 2023, the Ministry of Health has embarked on a goal to develop a national dental amalgam action plan by the end of 2024. Thence the country is yet to formulate restorative practice guidelines to steer the DAPD process. Auspiciously, an integral part of Kenya's Oral health Policy 2022 to 2030 is to develop a national plan to phase down the use of DA, promote mercury-free alternatives thus anchoring eco-friendly dentistry.[3] To realise implementation of the DAPD process initial capital is required to equip the dental facilities in low and middle income countries like Kenya unlike in high income countries; pre-requisite infrastructure and technology are mandatory for DA alternatives.[4,5]

Commitment to change (CTC) refers to the individual's mind-set that binds them to a pathway to enact a change initiative, it encompasses positive attitude, willingness to support [6] and individual readiness to change [7] and participate in change implementation. Commitment to change CTC has been used to predict perceived implementation of professional practices.[8] The commitment to the convention by the stakeholders is crucial, and it should be established and monitored from the onset of national phase-down activities. Dentists are principal stakeholders of the DAPD process for countries. Their adoption of

the commitment to change has been influential in shaping the landscape of the process. However initial response to the phase down was characterised by apathy, poor attitude and lack of capacity to use dental amalgam alternative restoratives (DAARs) by dentists.[9,10] DAARs are mercury-free dental restoratives applied in posterior teeth. One factor that positively affects CTC in individuals is involvement in the decision making for change [11]. Dentist's perspectives were considered in the negotiations of the MCM to phase out mercury containing products. Position papers from dentists' associations world-wide including Kenya were tabled by World Dental Federation, who argued against phasing out dental amalgam by 2020, distinguishing it from other mercury-containing products.[1]

There is paucity of literature on dentists' CTC with regard to the various practice techniques despite the dynamic nature of the profession. In a study done among physicians, capabilities had an influence on affective commitment. A targeted training on emergency procedures had an positive influence on their commitment [12]. From the outset as Kenya develops the DAPD action plan, assessment of the dentists' willingness to change will inform the implementation process at baseline and serve as a reference for monitoring and evaluation of the process. Furthermore, CTC is one of the few tools that can be used to foster and appraise behavioral changes induced by an educational intervention.[13,14] Moreover, continuous professional training (CPD), which is education that takes place after initial professional qualification has been universally implemented. Hence the objective of this study was to evaluate the dentists' commitment to change after implementing online CPD training on MCM and DAPD.

MATERIALS AND METHODS

This was a descriptive cross-sectional study that employed purposive sampling as it targeted dentists who needed capacity building in DAPD. The Yamane Taro 1967 formula was used to calculate the sample size n =260, from a study population of 750 dentists who were retained in the Kenya Medical and Dentists Council register as at 2022. The 750 dentists were invited using the national dental association directory, via a bulk short text message that included a link to participate in the study. As a result, dentists who required training on DAPD agreed to participate in the study.

The research team developed a 3-hour long CPD virtual training that focussed on DAPD measures with an emphasis on mercury-free alternative restorative dental materials, and preventive minimally invasive dentistry Table 1. Two questionnaires with open-ended questions were developed, the first one collected qualitative data on intended restorative changes immediate after the last session of the DAPD training. While the second one was for collecting qualitative data after 3 months on the status of implementation of the committed restorative changes. A consent form was provided before the first page of the questionnaire, informing the participants of the study's' objectives and asking for their agreement. Both the training programme and the questionnaires were piloted among 26 dentists and input used to improve the tool. The principal researcher delivered the training programme and administered the questionnaires.

The virtual training occurred in two consecutive evenings in November 2022.

Sessions were delivered on *zoom* and comprised of four 30 minutes didactics. Followed by a 30-minute video demonstration on manipulation of four selected alternative restoratives, and finally a question-and-answer session. The webinar was recorded for research purposes and made accessible to participants in the University of Nairobi repository for future use.

A *Limesurvey* link to the first questionnaire was communicated online, in this the participants indicated the restorative change(s) they intend to implement.

Data on the self-rated reflection on the status of implementation of the intended restorative changes was collected online three months after the training. It was analysed using the *Nvivo 14 (Lumivero*), inductive analysis was performed to map out implementation levels. Subsequently classified into the three-point commitment to change tool to denote the level of implementation; *fully implemented, partially implemented and not be implemented.*

Ethical approval of the study was obtained from the University of Nairobi/Kenyatta National Hospital Ethics and Research Committee (P616/07/2021).

Sociodemographic data was analysed using spreadsheets (Microsoft Excel version 2013), summarised and presented in tables and figures.

Table 1

Timetable of the webinar training sessions

No.	Training session	Overview of content	No. of participants	Trainer
Lecture 1 & 2	Knowledge on MCM and DAPD	Introduction, genesis, measures and impact on modern restorative practice	n = 216	Principal researcher
	Dental caries prevention and alternative restoratives in DAPD	Innovative integration of dental caries prevention in restorative and minimally invasive dentistry		
Lecture 3 & 4	Resin based alternative materials	Types including new biomaterials, properties and indications		
	Glass monomer based alternative materials			
Practical Session (online Videos)	Manipulation of selected dental amalgam alternatives	Handling and steps in clinical placement of Bulk fill resin composites, alkaline restorative materials, glass hybrid and highly viscous glass monomer cement.		

RESULTS

Of the targeted 260 participants, 216 attended the two DAPD training sessions, a response rate of 83.1%. Among these 147 (68.1%) indicated CTC responses. The male female ratio was 1:1.6 and their ages ranged from 24-73 with a mean of 37 (SD 10.7). SD is the measure of the variation an observation from the sample mean. A sizeable number 94 (64%) held a basic dental degree as their highest qualification, while 56 (38.1%) attained it after 2011 Table 2.

Table 2

Sociodemographic characteristics of the study participants

Variable	Category	n %
Gender n= 129		
i.	Male	47 (36.4)
ii.	Female	82 (63.6)
Age in years n=129		
i.	24 – 40	93 (72.1)
ii.	40 – 50	14 (9.7)
iii.	50 and above	22 (15.1)
Highest qualification n=129		
i.	BDS	94 (72.9)
ii.	Masters and	35 (27.1)
Year of primary qualification n= 109		
i.	<1990	9 (8.3)
ii.	1991 - 2000	13 (11.9)
iii.	2001 - 2010	31 (28.4)
iv.	>2011	56 (51.4)

Overall, the total number of commitment statements were 434, mean 2.95 and range 1-6, and all (100%) were aligned to the DAPD.

Three months post-training 46 (31.3%) participants reported the status of implementation. A total of 130 (30.0%) commitment reflections were submitted. The most frequent implementation status of the commitment responses was "*partially implemented*" 66 (50.8%), whereas the least status was *"fully implemented"* 31 (23.8%). The most common implemented practices were use alternative restorative materials 33 (25.4%) followed by emphasis on dental caries prevention 16 (12.3%). Notably of the DAAR dental material for use in posterior restorations, the smart resin based restorative material (alkaline) received the highest implementation status 6.2%. Contrarily glass hybrid and compomers had the least self-reflection commitment implementation Table 3.

Table 3

Distribution of commitment to change reflections of the study participants

Participants CTC statements	Fully implemented n %	Partially Implemented n %	Not implemented n %	Total n %
Ensure good waste management of amalgam in the clinic if one uses it on a patient	0 (0)	3 (2.3)	1 (0.8)	4 (3.1%)
Attending more Continuous medical education on dental materials	1 (0.8)	3 (2.3)	3 (2.3)	7 (5.4)
Use Glass ionomer cements	2 (1.6)	2 (1.6)	1 (0.8)	5 (4.0)
Use alkasite based materials	1 (0.8)	5 (3.8)	2 (1.5)	8 (6.2)
Use of bulk fill composite	1 (0.8)	2 (1.5)	2 (1.5)	5 (3.8)
Use alternative restorative materials 95% of the time	9 (6.9)	19 (14.6)	5 (3.8)	33 (25.4)
Stop use of amalgam	1 (0.8)	2 (1.5)	1 (0.8)	4 (3.1)
Reduce the use of amalgam	1 (0.8)	5 (3.8)	0 (0)	6 (4.6)
Condition tooth prior to using glass ionomer cements	2 (1.5)	7 (5.4)	2 (1.5)	11 (8.5)
Use of indirect restorative materials in very large cavities	2 (1.5)	4 (3.1)	2 (1.5)	8 (6.2)
Use of rubber dam, pre-wedging and sectional matrices, incremental packing of composites	4 (3.1)	3 (2.3)	6 (4.6)	13 (10.0)
Continually assess intensity of my light curing unit	2 (1.5)	2 (1.5)	2 (1.5)	6 (4.6)
Practice minimally invasive dentistry	0 (0)	3 (2.3)	2 (1.5)	5 (3.8)
Emphasis on dental caries prevention and minimally invasive dentistry	6 (4.6)	6 (4.6)	4 (3.1)	16 (12.3)
Total	31 (23.8)	66 (50.8)	33 (25.4)	130 (100)

Among those who committed to change, a majority 92 (62.6%) indicated challenges of implementation, the most being inadequate funding 41.3%, while a minority (4.3%) stated lack of knowledge Figure 1.

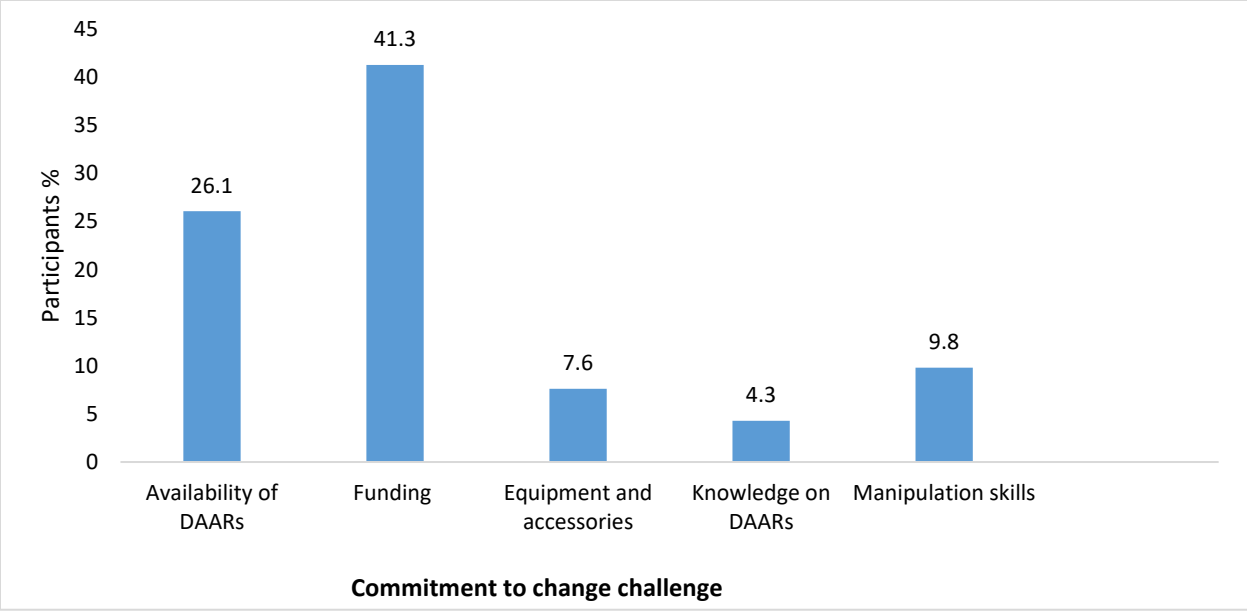

Figure 1: Frequency distribution of challenges to implementation of intended practice changes

DISCUSSION

The study employed a CTC tool which is one of the few tools available to promote and assess change following an educational interventio.[8,13,14] Although continuing education has introduced numerous practice changes in dentistry over the years, there is paucity of studies on dentists' commitment to adopting these respective practices. To our knowledge, this study represents the first investigation into dentists' CTC regarding the global DAPD process, nonetheless CTC is understudied in health care.[7] The fact that there were more females than males may imply the willingness of female Kenyan dentists to adapt to trends brought about by DAPD in restorative dentistry. While it can be speculated that the fact the majority were primary degree holders corresponds to the ratio of general dentists versus specialists in the country.

The dentists were requested to indicate their planned practice changes right after completion of the DAPD training. A similar approach employed among physicians yielded enhanced CTC level in both the study and control groups.[14] This may potentially explain the high response rate realised in this study. The objective of evaluating the dentists' CTC in adopting new restorative practices was partially met as more than two thirds of the sample size participated. DAPD has multipronged strategic areas one of which entails increasing national capacity of oral health professionals, towards preventive and non-operative minimally invasive dental care by developing training materials and resources.[5] However, this strategy cannot be achieved if the implementation of the training programme is not accompanied by change in dental practice. Which positions CTC as a central instrument in monitoring and evaluation of the DAPD process for countries. Majority of the dentists CTC and submitted intended practice changes after the training, which reveals readiness to phase down the use of DA among Kenyan dentists. Moreover, readiness has been associated with CTC as

reported in a study among nurses.[7] The level of CTC realised in the current study differs with that of a retrospective observational study among various health professionals, dentists were the least likely to make a commitment compared to physicians, nurses and pharmacists.[15]

An unanticipated finding in the current study was that majority of the participants were younger dentists. The use of alternative restoratives in place of dental amalgam and minimally invasive dentistry has been taught in dental schools in the past few decades, Kenya, South Africa, Irish United Kingdom, Canada, and United States of America.[16,17] While contrarily older dentists were drummed on the use of dental amalgam, and are reported to need capacity building in DAPD.[5,16] This implies that the DAPD CPD was relevant to both younger and older dentists highlighting the necessity of this training across all dental professionals.

Notably, all the commitment statements were aligned to DAPD, which depicts the participants understanding of the facets of the new preventive and minimally invasive dentistry that employs DAARs. Furthermore, the six themes drawn from the commitment responses comprehensively encompass the role of dentists as stakeholders in the DAPD process. This may be a pointer to the effectiveness of the training in elucidating the practice elements that constitute phasing down of the use of dental amalgam. Being capacity build in a change area is foundational, as it places a participant at a vantage position to be enthusiastic and willing to support the change, which has been shown to positively influence affective commitment. Since the new practice changes are to be integrated into existing long term mastered competencies, the training undertaken in this study is pivotal in fostering the CTC. Though not in the health sector, participation in decision making and information among participants are key to CTC. The negotiation for a DAPD process verses a phase out was arrived due to concerted efforts of umbrella organisation and dental associations globally. Kenya Dental Association submitted a position paper on behalf of the dentists to support DAPD, which is a stretched resemblance of participation, and may further explain CTC response in this study. While information on DAPD started right after the signing of the MCM in 2013, commencing with the East Africa DAPD project I in which Kenyan dentists participated.[18] These may add to explain the CTC level in the current study.

The most committed practice change by the dentists was to use alternatives to dental amalgam in most of the posterior restorations followed by emphasise on dental caries prevention. The two practice changes are the hall mark of the contemporary restorative model, preventative minimally invasive dentistry in the era of DAPD [1]. The finding in this study is similar to a study among physicians where a specific training on emergencies had a positive influence in their affective commitment.[12] Whereas in a study among medical laboratory staff situational leadership positively affected CTC.[19] Additionally, dentists, dental therapists, hygienists, assistants, and support staff in a United States of America Tribal health care system were reported to be supportive to change that promotes evidence based practices when they perceive management to be of high quality.[20] Leadership in the current study may be viewed to stem from the training which entailed communication of practice guidelines, the philosophy and procedures that encompass DAPD. This has been identified to positively impact national DAPD processes although CTC per se has not been evaluated [5].

In yet another study, continuous education improvement was reported as a positive factor that influenced CTC.[19] The design of the training in the current study was CPD which has been a preferred mode of professional training. Nevertheless, CPDs have a downside of optional attendance by professionals.

Although a greater portion of dentists committed to change aspects of their practice, lack of funding was cited by a majority as a profound challenge, followed by unavailability of alternative restorative materials. This may perhaps explain why only a third of dentists submitted their CTC reflections at three months. In the current study, the challenges experienced may have led to the outcome of implementation status revealed by this study, where most CTC reflection was partially implementation with the least being fully implemented. Additionally, government involvement is phenomenal, setting national policies with objectives for dental caries prevention, guidelines on the use of alternative restoratives in place of dental amalgam it's and research of new materials. Hence, overcoming the challenges hindering execution of the committed responses by the participants goes beyond the individual dentists and requires address by DAPD stakeholders, including policy makers. Auspiciously, Kenya is off to a strong start having ratified the MCM in September 2023. The country has anchored eco-friendly dentistry and DAPD in its National Oral health policy 2022 – 2030, Ministry of Health has initiated the formulation of the national DAPD action plan .[3]

CONCLUSION

Majority of the participants CTC aspects of their operative practice, and all intended changes were aligned to DAPD. Three months post-training, a third of the participants submitted commitment reflections. Majority of the dentists had "*partially implemented"* their intended changes, with the most implemented practice being use of alternative restorative materials in posterior teeth. Although the majority of the dentists committed to implement changes towards phasing down the use of dental amalgam, the challenges they faced such as inadequate funding and unavailability of alternatives may have impeded the process.

REFERENCES

1. Unep. Minamata Convention on Mercury - Text and Annexes. UNEP, 2013a. 2013;69.
2. Giacaman RA, Muñoz-Sandoval C, Neuhaus KW, Fontana M, Chałas R. Evidence-based strategies for the minimally invasive treatment of carious lesions: Review of the literature. Adv Clin Exp Med. 2018;27(7):1009–16.
3. Ministry of Health K. Kenya National Oral Health Policy [Internet]. 2022. Available from: https://www.afro.who.int/sites/default/files/2022-08/KENYA-NATIONAL-ORAL-HEALTH-POLICY-2022-2030.pdf
4. Osiro OA, Kariuki DK, Gathece LW. The Minamata Convention on Mercury and its implications for management of dental caries in low and middle-income countries. Int Dent J. 2019 ;69(4):247-251.
5. Fisher J, Varenne B, Narvaez D, Vickers C. The Minamata Convention and the phase down of dental amalgam. Bull World Health Organ. 2018;96(6):436–8.
6. Herscovitch, Lynne Meyer JP. Commitment to organizational change: Extension of a three-component model. J Appl Psychol. 2002;87(3):474–487.
7. Harrison R, Chauhan A, Le-Dao H, Minbashian A, Walpola R, Fischer S, et al. Achieving change readiness for health service innovations. Nurs Forum. 2022;57(4):603–7.
8. Shershneva MB, Wang M fen, Lindeman GC, Savoy JN, Olson CA. Commitment to practice

change: An evaluator's perspective. Eval Heal Prof. 2010;33(3):256–75.
9. Alexander G, Hopcraft MS, Tyas MJ, Wong RHK. an ' amalgamless ' profession . Part 5 : knowledge factors. 2017;440–52.
10. Faraj BM, Mohammad HM, Mohammad KM. The Changes in Dentists' Perception and Patient's Acceptance on Amalgam Restoration in Kurdistan-Iraq: A Questionnaire-based Cross-Sectional Study. J Clin Diagnostic Res. 2015;9(4):ZC22-5.
11. Cummings TG and WCG. Organization Development and Change. Cengage Learning. Boston; 2014.
12. Noval De La Torre A, Bulchand Gidumal J, Melián González S. The organizational commitment of emergency physicians in Spanish public hospitals. An Sist Sanit Navar. 2016;39(3):371–8.
13. Wakefield J, Herbert CP, Maclure M, Dormuth C, Wright JM, Legare J, et al. Commitment to change statements can predict actual change in practice. J Contin Educ Health Prof. 2003;23(2):81–92.
14. Mazmanian PE, Daffron SR, Johnson RE, Davis DA, Kantrowitz MP. Information about barriers to planned change: A randomized controlled trial involving continuing medical education lectures and commitment to change. Acad Med. 1998;73(8):882–6.
15. Chahal JK, Northrip K, Silva D. Are You Ready for Change? Factors Associated With Commitment To Change in Clinical Practice. Innov Aging. 2019;3(Supplement_1):S2–S2.
16. Zoebali M, Osiro OA, James RM. Minamata convention on mercury: An online survey on knowledge and attitude towards restorative practice among dental students and dental interns in Kenya. East Afr Med J [Internet]. 2022;99(11):5399–406. Available from: https://www.researchgate.net/publication/366863931
17. Lynch CD, McConnell RJ, Wilson NHF. Trends in the placement of posterior composites in dental schools. J Dent Educ. 2007;71(3):430–4.
18. UNEP. Desk Study On Waste Management Practices And Trade Flow Of Dental Amalgam And Its Alternatives In Kenya, Tanzania And Uganda [Internet]. Available from: https://www.unep.org/resources/report/desk-study-waste-management-practices-and-trade-flow-dental-amalgam-and-its
19. Waraksa-Deutsch TL. Leading medical laboratory professionals toward change readiness: A correlational study. Lab Med. 2024;55(3):255–66.
20. Randall CL, Hort K, Huebner CE, Mallott E, Mancl L, Milgrom P, et al. Organizational Readiness to Implement System Changes in an Alaskan Tribal Dental Care Organization. JDR Clin Transl Res [Internet]. 2020;5(2):156–65. Available from: https://doi.org/10.1177/2380084419871904