



RESEARCH ARTICLE

REVISED Community social responsibility of continued and appropriate use of silver amalgam as dental restorative material in southern India: A cross-sectional study [version 5; peer review: 2 approved, 1 approved with reservations]

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Abstract

Background

For more than 150 years, dental amalgam (DA) has been popular as a dental restorative material. Many organizations oppose its use due to perceived toxicity and environmental concerns. Hence, this study aimed to explore the continued use of DA from a South Indian dental practitioners' perspective.

Methods

This cross-sectional study was conducted among fifty-two private and public dental practitioners of Udupi district in Southern India. A self-administered questionnaire was distributed, that involved assessment of their preferences, continuation of use and concerns of using DA as a restorative material. The percentage contribution of

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1. Manjunath P Puranik , Government Dental College and Research Institute,

each variable was calculated. Preferences for continuation of use of silver amalgam based upon the age, experience and mercury toxicity as a risk factor were analyzed using Students-t test and Fisher's Exact Test test.

Results

Most dentists were satisfied (87%) with the results of the DA, found minimal failures (96%) and found DA more economical (89%). More than half (54%) of the participants reported that they would not continue the use of DA owing to mercury toxicity and environmental concerns. Dentists with higher age and longer clinical experience preferred continuation of DA.

Conclusions

Despite satisfaction with DA for its minimal failure, longevity and affordability, the authors found that most practitioners did not prefer its continued usage. This highlights their concerns over mercury toxicity and soft tissue lesions and accentuates their community social responsibility. There is also an urgent need to educate dentists on mercury hygiene, mercury waste management and disposal.

Keywords

dental amalgam, mercury toxicity, social responsibility, dental material, waste management, dental education, affordability



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REVISED Amendments from Version 4

We have now applied Fisher's Exact Test as a replacement of Chi-square test, since the expected frequencies of few cells were less than 5 (Table 5). We have also mentioned Confidence Intervals for proportions (Tables 1 & 2).

Any further responses from the reviewers can be found at the end of the article

Introduction

Dental amalgam (DA) has been popular as a restorative material for more than 150 years particularly in large cavities, owing to tremendous mechanical properties and durability. It makes up for seventy-five percent of all dental restorations performed across the world [Bharti *et al.*, 2010]. DA is a combination of alloy particles and elemental mercury. The usage of the “silver paste” was first found in the Chinese medical texts written by Su Kung in 659 AD [Hsi-T'ao, 1958]. In early 1800s, D'Arcet Mineral Cement was developed in France, which is regarded as the first dental amalgam [Magkert, 1991]. The use of room temperature mixed amalgam as a dental restorative material was formerly advocated by Bell in England (1819) and Traveau in France (1826) [Frykholm, 1957 and Greener, 1979].

Functionally and financially, DA has been a source of great comfort for the common man. The plasticity and strength of the restorative material is a quality that has made dental practitioners utilize it not just for regular restorative work, but also for the making of dental Inlays and Onlays [Bharti *et al.* 2010].

In recent times, we have noticed a ‘phase-down’ of DA in many parts of the world [Espelid *et al.*, 2006; Al-Asmar *et al.*, 2019; Spencer, 2000; Brennan and Spencer, 2003] have reported reducing use of DA in recent times [Brennan and Spencer, 2003]. In a study conducted by Al-Asmar *et al.*, shift to aesthetic restorations were seen among the dentists. In another study, DA usage was reduced, yet constituted more than half of the restorations during the 5-year period under review [Umesi, Oremosu and Mekanjuola, 2020].

Since the beginning there have been debates around its usage. In 1833, the Crawcour brothers introduced a newer version of DA “The Royal Mineral Succedaneum” to America that resulted in multiple failed amalgam restorations that sparked the “First Amalgam War” in 1845 [Molin, 1992]. The American Society of Dental Surgeons condemned amalgam usage as malpractice and if used, member would be expelled from the society [Mosteller, 1961]. The criticism of amalgam gradually muted with improved handling and performance of the amalgam versions put forth by Elisha Townsend, J Foster Flagg and G.V. Black [Flagg, 1843; Cannon *et al.*, 1985]. The “Second Amalgam War” resulted from the writings of Dr Alfred Stock, who was poisoned with mercury through the twenty- five years of exposure to the metal [Weiner, Nylander and Berglund, 1990]. A committee was appointed to study allegations, which concluded that amalgam has a rightful place in dentistry and that there was no reason to stop its use [Eames, 1959]. The current controversy popularly known as “Third Amalgam War” stemmed from the words of HA Huggins in 1973 who suspected that everything from leukemia to bowel disorders could be due to patient’s reaction to mercury [Huggins, 2007]. The Consumer Report of 1986 exposed this anti - amalgam movement that subsided this controversy. Again, the “60 Minutes” TV program re-intensified the issue again thereby creating considerable public alarm [Dodes, 2001].

Mercury is present in abundance in the natural environment and a substantial number of people are exposed to it in various ways [Dodes, 2001]. Yet, any symptoms of unknown etiology have been frequently linked to water fluoridation and dental amalgam restorations [Boyd *et al.*, 1991; Huggins, 2007].

In recent times, various organizations around the world have attempted to reduce the usage of DA. Its usage is brought down after the Minamata convention, a global health and environment treaty that governs the mining, usage and trade in mercury. It entreats for “phase down of dental fillings using mercury amalgam”. It included various strategies like “aiming at dental caries prevention and use of mercury-free dental restoration alternatives and on promoting best management practices. As well as promoting the use of best environmental practices in dental facilities to reduce release of mercury and mercury compounds to water and land” [Minamata Convention, 2014].

The European Commission’s Scientific Committee on Health and Environmental Risks (“SCHER”) authenticates that “dental amalgam in the environment can methylate (forming methylmercury, which is the most toxic form of mercury)” [SCHER, 2014]. In 2015 the European Commission’s Scientific Committee on Emerging and Newly Identified Health Risks (“SCENIHR”) changed their stance from amalgam is “a safe and effective restorative material” to that amalgam is only “an effective restorative material” [SCENIHR, 2014, 2015]. Based on these, the European Union has accorded the “Berlin declaration” in 2017 to end amalgam use in Europe by 1 July 2022 [Berlin Declaration, 2017].

In contrast, there is vast research done that supports DA usage and provides scientific evidence for its safety [Heggland *et al.*, 2011; Melchart *et al.*, 2008; Woods *et al.*, 2008]. Many other organizations too contradict the above standpoint of SCHER and SCENIHR [U.S. Food and Drug Administration, 2020; National Institute of Health, 2006; Alzheimer's myths; Uçar and Brantley, 2017]. No correlations were found between exposure to DA and neuropsychological and renal functions in many randomized trials done all over the world [Bellinger *et al.*, 2006; Barregard, Trachtenberg, and McKinlay, 2008; Lauterbach *et al.*, 2008]. A systematic review and meta-analysis conducted by Aminzadeh and Etminan did not provide evidence for or against an association between the presence of DA restorations and multiple sclerosis [Aminzadeh and Etminan, 2007].

Studies did not find any association between urinary mercury concentrations among dentists and dental nurses with self-reported memory disturbance or mercury vapors in the dental office with cytogenetic damage to leukocytes [Ritchie *et al.*, 2004; Atesagaoglu *et al.*, 2006].

The U.S. Food and Drug Administration states, "We have reviewed the best available scientific evidence to determine whether the low levels of mercury vapors associated with dental amalgam fillings are a cause for concern. Based on this evidence, U.S. Food and Drug Administration considers dental amalgam fillings safe for adults and children aged six and above. Clinical studies in adults and children ages six and above have found no link between dental amalgam fillings and health problems" [U.S. Food and Drug Administration, 2020]. The National Institute of Dental and Craniofacial Research in the U.S. Dept. of Health and Human Services also states that children whose cavities were filled with dental amalgam had no adverse health effects. The findings included no detectable loss of intelligence, memory, coordination, concentration, nerve conduction or kidney function during the 5-7 years the children were followed" [National Institute of Health, 2006].

Given the dual stance of dental amalgam usage by various organizations around the world, and notable reduction in DA usage over the years by dental practitioners, we wanted to explore the continued usage of silver amalgam as a tooth restorative material, from South Indian dental practitioners' perspectives in an unbiased manner.

Methods

Ethics statement

This study was initiated after approval from the Kasturba Medical College and Kasturba Hospital Institutional Ethics Committee [dated 12/2018; Reference No. 569], which is the ethical committee for MAHE University. The study was conducted in agreement with the World Medical Association Declaration of Helsinki, 1975. Prior to the start of study, a signed informed consent for participating in the study and reuse of anonymized data was received from each participant.

Study design

A cross-sectional study was conducted over a duration of sixteen weeks in 2019 from second week of January to second week of May across various dental practices in the district of Udupi in alliance with Indian Dental Association, Udupi district branch, in Southern India. The inclusion criteria for the study participants were (i) Government or private practitioners (ii) Dental practitioners who have the willingness and who consented to participate in the study. The exclusion criteria for the study were: (i) those practicing for less than 5 years; and (ii) inability/unwillingness to participate in the study.

A total of one hundred and thirty-four (134) dental practices encompassing all the seven 'Taluks' were identified. Since it was a small population size, a complete enumeration of the study population was done. They were assessed on questions relating to their opinions of using DA.

Private dental clinics: The list of registered practitioners in Udupi district as per the Karnataka State Dental Council Registration list was used as a reference document for contacting the clinics individually. Access to this list was granted after the authors submitted a request to the Karnataka State Dental Council. Names and mail addresses were also obtained from the list of the largest non-governmental dental organization in India, namely the Indian Dental Association, Udupi branch. Access to this list was granted after the authors submitted a request to the Indian Dental Association.

Public health care centers: Oral health delivery in public sector is unified into the existing public hospital setups and is available from community health centers and district hospitals. So, we included practitioners from six Community Health Centers (CHCs) and the district hospital, details of the same obtained from official portal of Karnataka State Health Ministry (District wise Hospital details with facilities).

After excluding those not fulfilling the inclusion criteria, ninety-two (92) participants were available for the study. Due to the small population size, we included all the practitioners, public and private, in the study.

Questionnaires were distributed through email and communication network of IDA Udupi District branch. We attempted to contact non-respondents during the conduct of four Continuing Dental Education programs for dental practitioners to ensure maximum participation of respondents.

A self-administered questionnaire [Nayak, 2022] assessing the practitioners' preferences, continuation of use and concerns of using DA as a restorative material was developed based on similar studies [Brennan and Spencer, 2003; Maciel *et al.*, 2017; Espelid *et al.*, 2006]. Four subject experts checked the face validity and content validity of questions and finalized the questionnaire. A pilot survey was conducted among 15 dentists working in an academic setting to confirm the needed background preparations and clarity of specific terms in questionnaire that could seem unclear. The findings and responses of pilot study were found to be favorable, facilitating the initiation of the larger planned study. Their responses, however are not included in the study results.

The questionnaire consisted of two sections: (a) Four questions on respondents' demographic and professional particulars: age, gender, qualification and type of practice and (b) fourteen closed-ended questions regarding duration of DA usage and preferences for DA over other restorative materials, preferred type of cavity for DA usage, experiences regarding ease of use, longevity, failures, soft tissue lesions and mercury toxicity during DA usage as well as on patient affordability and satisfaction of DA.

Statistical analysis

Responses were documented on Microsoft Excel and data analysis was performed using IBM *Statistical Package for the Social Sciences* (SPSS) version 26 (IBM Corp., Armonk, N.Y., USA). The percentage contribution was obtained for each significant variable. Preferences for continuation of use of silver amalgam based upon the age of dentists has continuous variables, so analysis was done using Students t-test. Since the sample was small, Shapiro Wilk test was done was performed, which did not show evidence of non-normality ($W = 0.78$, $p\text{-value} = 0.26$). Results of preferences for the use of DA by practitioners, duration and satisfaction of usage of DA, experiences regarding longevity, their perceptions on the risks associated with DA and patient satisfaction of restorations were analyzed using Fisher's Exact test at 5% level of significance.

Results

As the population size was small, a complete enumeration of all the 134 dental practitioners was done. Of these, only Ninety-two practitioners fulfilled the inclusion criteria, and hence were included in the study. Out of them, 52 dental practitioners responded (Response rate 55.9%). About the gender distribution, there were equal number of male and female participants (26 out of 52 each). The mean age group of study population was 34.9 years.

Table 1 describes the experience and satisfaction for DA use among practitioners. About 77% of participants reported that they have been using DA for less than ten years and 87% participants were very satisfied/satisfied with its use. The longevity of DA is highly appreciated by the dental practitioners as 44% and 48% participants found the longevity "Very Good" and "Good" respectively. Most of them reported that their patients were 'very satisfied' and 'satisfied' (76.9% and 15.4% respectively) of the DA restorations.

Table 1. Experience and satisfaction for DA (dental amalgam) use among practitioners.

	Variable		N (%)	Confidence Intervals (CI)
1	Duration of usage of silver amalgam	Less than 10 years	40 (76.9%)	64% - 88%
		10 to 20 years	9 (17.3%)	6.8% - 27.2%
		20 to 30 years	2 (3.8%)	1.3% - 8.9%
		30 or more years	1 (1.9%)	1.7% - 5.5%
2	Satisfaction for usage of silver amalgam	Very satisfied	15 (28.8%)	16.7% - 40.9%
		Satisfied	30 (57.7%)	44.4% - 71%
		Dissatisfied	7 (13.5%)	13.1% - 13.9%
		Very dissatisfied	0	-

Table 1. *Continued*

	Variable		N (%)	Confidence Intervals (CI)
3	Experience regarding longevity of the restoration	Very good	23 (44.2%)	30.7% - 57.7%
		Good	25 (48.1%)	34.6% - 61.6%
		Fair	4 (7.7%)	0.4% - 15%
		Poor	0	
4	Experience regarding patient satisfaction for silver amalgam	Very satisfied	8 (15.4%)	14.9% - 15.9%
		Satisfied	40 (76.9%)	65.6% - 88.2%
		Dissatisfied	4 (7.7%)	0.4% - 15%
		Very dissatisfied	0	
5	Experience regarding failure of restoration	Very minimal (small) number	15 (28.8%)	16.5% - 41.1%
		Minimal (small) number	35 (67.3%)	55% - 79.6%
		Large	1 (1.9%)	1.8% - 2%
		Very large	1 (1.9%)	1.8% - 2%
6	Experience regarding any soft tissue lesions due to silver amalgam	Yes	21 (40.4%)	27.1% - 53.7%
		No	31 (59.6%)	46.4% - 72.9%
		Total	52 (100%)	

Table 2 describes the opinions and preferences of practitioners for DA usage. Regarding the ease of use, equal number (48% each) of participants found it “easy to use” and “difficult and cumbersome”. When asked about the type of cavity for which they would prefer to use DA, 46 (59.6%) participants responded that they would use it for medium and large cavities. They also reported that DA is the material of choice economically as 89% of participants found it economical and 98% found it affordable by patients. Yet, 54% of the participants reported that they would not suggest the use of DA compared to other tooth-colored restorations.

Table 2. Opinion and preference for the use of DA (dental amalgam) by practitioners.

	Variable		N (%)	Confidence Interval (CI)
1	Opinion regarding ease of use of silver amalgam	Very easy	2 (3.8%)	2.2% - 5.4%
		Easy and comfortable	25 (48.1%)	34.6% - 61.6%
		Difficult and cumbersome	25 (48.1%)	34.6% - 61.6%
		Very difficult	0	
2	Preference for silver amalgam use based on size of the cavity	Very large	5 (9.6%)	1.6% - 17.6%
		Large	26 (50%)	36.5% - 63.5%
		Medium	21 (40.4%)	27.1% - 53.7%
		Small	0	
		Very small	0	
3	Material of choice - economically	Very economical	6 (11.5%)	2.9% - 20.1%
		Economical	40 (76.9%)	65.6% - 88.2%
		Not economical	6 (11.5%)	2.9% - 20.1%
4	Affordability for patients	Very affordable	9 (17.3%)	6.9% - 27.7%
		Affordable	42 (80.8%)	70.1% - 91.5%
		Unaffordable	1 (1.9%)	2.1% - 2.3%
5	Opinion regarding continuation of use/suggest usage than other tooth-colored materials	Yes	13 (25%)	1.8% - 6.8%
		No	28 (53.8%)	40.1% - 67.5%
		Not sure	11 (21.2%)	10.3% - 32.1%
		Total	52 (100%)	

Table 3 elucidates the perception and awareness for DA use as a risk factor. It was found that nearly 94% were aware of mercury toxicity concerns. Moreover, 46% and 37% participants felt that using DA as a restorative material could pose a risk factor for pregnant women and children respectively.

Preference for continued usage of DA based upon the age of dentists, showed statistically significant differences, with older practitioners preferring DA more (**Table 4**). Likewise, a significantly greater number of experienced practitioners preferred continued use of DA as well as being very satisfied with DA usage (**Table 5**).

Table 3. Perception and awareness for DA (dental amalgam) use as a risk factor among practitioners.

Variable			N (%)
1	Perception for silver amalgam use as a risk factor for pregnant women	Yes	24 (46.2%)
		No	11 (21.2%)
		Not sure	17 (32.7%)
2	Perception of silver amalgam use as a risk factor for Children	Yes	19 (36.5%)
		No	15 (28.8%)
		Not sure	18 (34.6%)
3	Concerns about mercury toxicity on environment	Yes	49 (94.2%)
		No	2 (3.8%)
		Not sure	1 (1.9%)
		Total	52 (100%)

Table 4. Preference for continuation of use of silver amalgam based upon the age of dentists.

Variable		Age (Mean ± SD)	95%confidence interval of the difference		N	P value
			Lower	Upper		
Preference	Yes	40.7 ± 10.8	3.42	12.53	14	.001
	No	32.7 ± 5.5	1.54	14.41	38	
			Total		52	

p value derived by student t test, p < 0.05 considered significant.

Table 5. Preference for continuation of use of silver amalgam based upon experience of dentists.

Variable		Preference % (N)		P value
		Yes	No	
Duration of usage of silver amalgam	5 to 10 years	15% (6)	85% (34)	.001
	More than 10 years [#]	66.7% (8)	33.3% (4)	
	20 to 30 years	100% (2)	0	
	30 years or more	100% (1)	0	
Satisfaction with usage of silver amalgam	Very satisfied	80% (12)	20% (3)	<0.001
	Satisfied	3.3% (1)	96.7% (29)	
	Dissatisfied	14.3% (1)	85.7% (6)	

Table 5. *Continued*

Variable		Preference % (N)		P value
		Yes	No	
Experience regarding longevity of the restoration	Very good	47.8% (11)	52.2% (12)	0.006
	Good	8% (2)	92% (23)	
	Fair	25% (1)	75% (3)	
Experience regarding patient satisfaction for silver amalgam	Very satisfied	75% (6)	25% (2)	0.003
	Satisfied	17.5% (7)	82.5% (33)	
	Dissatisfied	25% (1)	75% (3)	
Total		26.9% (14)	73.1% (38)	

p value derived by Fisher's Exact Test, $p < 0.05$ considered significant.

*Cell frequencies were pooled.

Discussion

Silver amalgam as a dental restorative material has survived time and has successfully competed with various tooth-colored restorations in the market [Roulet, 1997; Antony *et al.*, 2008]. The longevity of the restoration, an extensive record of minimal failures in addition to being one of the most economic dental materials in the market, makes dentists and patients opt for the product especially in developing nations like India [Ukrainian Religious Studies, 1996; Maciel *et al.*, 2017; Peretz and Ram, 2002]. Hence, this study was conducted to explore the continued use of silver amalgam for dental restorations, from a South Indian dental practitioner's perspective in an unbiased manner.

In our study we witnessed that although most dentists were satisfied with longevity, minimal failures of DA restorations and cost-effectiveness, more than 50% of them reported that they would not suggest dental amalgam over other tooth-colored restorations. Reported continuation of DA usage is lesser in our study as compared to previous studies [Maciel *et al.*, 2017; Peretz and Ram, 2002]. This can be owed to their concerns over mercury toxicity, as 94% of practitioners were aware of its impact on the environment. Presence of environmental Mercury results in microbial antibiotic resistance, which in turn propounds health risk to humans and animals [Rahman and Singh, 2018]. This is in line with Minamata Convention that calls for reduction of DA usage [Minamata Convention, 2014]. Moreover, it was found from our study that tooth-colored restorations were preferred mostly by younger dentists as compared to older practitioners which could be due to comfortable working time and better aesthetics.

In contrast, more dentists with higher age and longer clinical experience preferred continuation of DA. This could be due to greater experience and confidence in handling DA. Other reasons for their preferences for DA usage could be cost effectiveness, minimal failures and patient affordability. These findings are comparable with other studies conducted by Maciel *et al.* [2017], Espelid *et al.* [2006] and Peretz and Ram [2002]. In our study, more than half of them preferred DA usage in medium and large cavities. This is in accordance with studies that show ineffectiveness of DA in very large cavities owing to higher chances of overhanging margins in proximal restorations [Ghulam and Fadel, 2018]. This could be due to the exceptional mechanical properties of DA over others as well as aggravation of pain and sensitivity with composite restorations in deeper cavities. However, a shift in the concept of 'extension for prevention' to a modern 'minimally invasive approach' with newer self-adhesive materials has further reduced the use of DA. This could be the reason for significantly lower preference for DA among younger practitioners. Further, not being aesthetic as compared to other restorations, DA also causes local soft tissue lesions like amalgam tattoo and lichenoid reaction and can trigger hypersensitivity and autoimmune disorders [Ghulam and Fadel, 2018]. This was like the results in our study, where 40% of practitioners had experienced soft tissue lesions due to DA restorations.

We observed that in the government run CHCs, none of the dentists are currently using DA. This can be attributed to (i) low rates of dental auxiliary recruitment at the CHCs, who are very much needed for handling of DA. (ii) non-availability of amalgam triturators in the government hospitals, (iii) Government's support for the Minamata convention. There is also an attempt to move towards phase-down of DA restorations in the governmental sector.

Moreover, the study results show that the practitioners lacked extensive knowledge on mercury toxicity, as not many of them felt that they could pose a risk factor for pregnant women and children. However, more than 90% of them expressed their concerns over mercury toxicity on environment. This highlights their concerns over mercury toxicity and soft tissue lesions and accentuates their community social responsibility. That is, even though DA demonstrates cost effectiveness, minimal failures and patient affordability, dental practitioners are reducing its usage. This substantiates

the dental practitioners' awareness of community well-being and environmental safety. Yet, as older practitioners still preferred DA, there is a need to sensitize them to the precautions to be taken on mercury hygiene as well as mercury waste management, its environmental effects, and guidelines of Minamata Convention. This also necessitates adopting and disseminating evidence on the use of dental restorative materials through continuing education programs.

Consequently, as our study and various authors [Al-Asmar *et al.*, 2019; Umesi, Oremosu and Mekanjuola, 2020] report, a majority of dental practitioners across the globe do not advise the use of DA over other tooth-coloured restorative materials. There is a prevailing notion that placing dental amalgam restorations can cause adverse health effects like impairing kidney function [Eggleston, 1994 and decreasing T-lymphocyte counts [Boyd *et al.*, 1991], although studies by Berglund [1990], University of Umea in Sweden found no evidence of kidney impairment in subjects with amalgam restorations.

Also, the hype generated from the three Amalgam Wars [Molin, 1992; Weiner, Nylander and Berglund, 1990; Huggins, 2007] raised considerable concerns about mercury toxicity amongst the patients and dentists, in spite of being disproved repeatedly. This discussion is still a relevant debate and different countries have laid down their guidelines regarding the use or restriction of amalgam as a dental restoration with many places where amalgam phase down is moving from a debatable domain to a legislative domain [Al-Asmar *et al.*, 2019; Umesi, Oremosu and Mekanjuola, 2020].

However, our study had certain limitations; a modest study population significant reduction in sample size occurred due to a minimum of five years of experience as inclusion criteria. Also, certain practitioners had completely shifted to tooth-coloured restorations, precluding them from the study. Among those included in the study, a significant number of participants did not respond, despite repeated reminders, citing busy patient schedules, making it a limitation of this study.

Conclusions

To draw inferences from this study, it is important to take a calculated decision while selecting the right restorative material based on individual case scenario and economics of the patient. India is a developing country where emphasis on oral health is minimal, and majority of the population is incapable of meeting increased expenses on dental treatment. Hence, dental amalgams still stand as a good restorative material for low-middle income countries.

However, there is an urgent need to educate dentists about the precautions to be taken on mercury hygiene as well as mercury waste management and disposal, which by itself can help in reducing mercury toxicity and subsequent effects. There is an imperative need to sensitize the dentists on the guidelines of Minamata Convention. Patients too have to be alerted about the dental materials based on evidence so that they do not instinctively believe in biased publicity of products.

The continued and appropriate use of DA is a decision that needs careful consideration in the times of newer dental cements and the spectrum of Composites. DA is a material that has been tried and tested. The newer materials too will face the test of time and will have to prove their efficacy in the coming decades.

Data availability

Underlying data

Open Science Framework: Community Social Responsibility of continued and appropriate use of Silver Amalgam as dental restorative material in Southern India. <https://doi.org/10.17605/OSF.IO/NUC5J> [Nayak, 2022].

This project contains the following underlying data:

- Udupi Amalgam study.xlsx (social responsibility of silver amalgam usage as a dental restorative material).

Extended data

Open Science Framework: Community Social Responsibility of continued and appropriate use of Silver Amalgam as dental restorative material in Southern India. <https://doi.org/10.17605/OSF.IO/NUC5J> [Nayak, 2022].

This project contains the following extended data:

- Questionnaire – Copy.docx

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](https://creativecommons.org/licenses/by/4.0/) (CC0 1.0 Public domain dedication).

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We acknowledge Late Dr K. S. Bhat, Former Dean, Manipal College of Dental Sciences, Manipal, MAHE for being the motivation behind the conduct of the study. We appreciate Kasturba Medical College Health Sciences Library, Manipal, MAHE for all logistic Support. We acknowledge Indian Dental Association, Udupi district branch for all related support and participating Dental practitioners of Udupi District, Karnataka State, India.

References

- Al-Asmar AA, Al-Khatib KM, Al-Amad TZ, *et al.*: **Has the implementation of the Minamata convention had an impact on the practice of operative dentistry in Jordan?** *J. Int. Med. Res.* 2019; **47**(1): 361–369.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Alzheimer's Myths: [Accessed on 2020 Nov 11].
[Reference Source](#)
- Aminzadeh KK, Etmianan M: **Dental amalgam and multiple sclerosis: a systematic review and meta-analysis.** *J. Public Health Dent.* 2007; **67**: 64–66.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Antony K, Genser D, Hiebinger C, *et al.*: **Longevity of dental amalgam in comparison to composite materials.** *GMS. Health Technol. Assess.* 2008; **13**(4): Doc12.
- Atesagaoglu A, Omurlu H, Ozcagli E, *et al.*: **Mercury exposure in dental practice.** *Oper Dent.* 2006; **31**: 666–669.
[Publisher Full Text](#)
- Ayushman Bharat: Pradhan Mantri Jan Arogya Yojana: [Accessed on 2020 Nov 11].
[Reference Source](#)
- Barregard L, Trachtenberg F, McKinlay S: **Renal effects of dental amalgam in children: the New England children's amalgam trial.** *Environ. Health Perspect.* 2008; **116**: 394–399.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Bellinger DC, Trachtenberg F, Barregard L, *et al.*: **Neuropsychological and renal effects of dental amalgam in children: a randomized clinical trial.** *JAMA.* 2006; **295**: 1775–1783.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Berglund A: **Estimation by a 24-hour study of the daily dose of intra-oral mercury vapor inhaled after release from dental amalgam.** *J. Dent. Res.* 1990; **69**(10): 1646–1651.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Berlin declaration to end amalgam use in Europe: 1 July 2022. [Accessed on 2020 Oct 10].
[Reference Source](#)
- Bharti R, Wadhvani KK, Tikku AP, *et al.*: **Dental amalgam: An update.** *J. Conserv. Dent.* 2010 Oct; **13**(4): 204–208.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Boyd ND, Benediktsson H, Vimy MJ, *et al.*: **Mercury from dental "silver" tooth fillings impairs sheep kidney function.** *Am. J. Phys. Regul. Integr. Comp. Phys.* 1991; **261**(4): R1010–R1014.
[Publisher Full Text](#)
- Brennan DS, Spencer AJ: **Restorative service patterns in Australia: amalgam, composite resin and glass ionomer restorations.** *Int. Dent. J.* 2003 Dec 1; **53**(6): 455–463.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Cannon MS, Kapes ED, Palkuti GA: **Dr. Black and the "amalgam question".** *J. Hist. Med. Allied Sci.* 1985 Jul 1; **40**(3): 309–326.
[PubMed Abstract](#) | [Publisher Full Text](#)
- District wise Hospital details with facilities: Last accessed on 23.05.
[Reference Source](#)
- DodesJE: **The amalgam controversy: an evidence-based analysis.** *J. Am. Dent. Assoc.* 2001 Mar 1; **132**(3): 348–356.
[Publisher Full Text](#)
- Eames WB: **Preparation and condensation of amalgam with a low mercury-alloy ratio.** *J. Am. Dent. Assoc.* 1959 Apr 1; **58**(4): 78–83.
[Publisher Full Text](#)
- Espelid I, Cairns J, Askildsen JE, *et al.*: **Preferences over dental restorative materials among young patients and dental professionals.** *Eur. J. Oral Sci.* 2006 Feb; **114**(1): 15–21.
[PubMed Abstract](#) | [Publisher Full Text](#)
- European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR): **Final opinion on the safety of dental amalgam and alternative dental restoration materials for patients and users (29 April 2015).** p. 69. [Accessed on 2020 Nov 05].
[Reference Source](#)
- European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR): **Preliminary opinion on the safety of dental amalgam and alternative dental restoration materials for patients and users (26 August 2014).** p. 66 [Accessed on 2020 Nov 05].
- Flagg JF: **Metallic pastes for filling teeth.** *Bost. Med. & Surg. J.* 1843 Dec 13; **29**(19): 382–384.
[Publisher Full Text](#)
- Frykholm KO: *On Mercury from Dental Amalgam: Its Toxic and Allergic Effects, and Some Comments on Occupational Hygiene.* Almqvist & Wiksells boktr; 1957.
- Ghulam OA, Fadel HT: **Can clusters based on caries experience and medical status explain the distribution of overhanging dental restorations and recurrent caries? A cross-sectional study in Madinah–Saudi Arabia.** *Saudi J. Biol. Sci.* 2018 Feb 1; **25**(2): 367–371.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Greener EH: **Amalgam—yesterday, today, and tomorrow.** *Oper. Dent.* 1979; **4**(1): 24–35.
[PubMed Abstract](#)
- Heggland I, Irgens Å, Tollånes M, *et al.*: **Pregnancy outcomes among female dental personnel—a registry-based retrospective cohort study.** *Scand. J. Work Environ. Health.* 2011; **37**: 539–546.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Hsi-T'AO C: **The use of amalgam as filling material in dentistry in ancient China.** *Chin. Med. J.* 1958; **76**: 553–555.
- Huggins HA: **Medical implications of dental mercury: a review.** *Explore.* 2007 Mar 1; **3**(2): 110–117.
[Publisher Full Text](#)
- Lauterbach M, Martins IP, Castro-Caldas A, *et al.*: **Neurological outcomes in children with and without amalgam-related mercury exposure: seven years of longitudinal observations in a randomized trial.** *J. Am. Dent. Assoc.* 2008; **139**: 138–145.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Maciel R, Salvador D, Azoubel K, *et al.*: **The opinion of children and their parents about four different types of dental restorations in a public health service in Brazil.** *Eur. Arch. Paediatr. Dent.* 2017 Feb; **18**(1): 25–29.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Magkert Jr: **Dental amalgam and mercury.** *J. Am. Dent. Assoc.* 1991 Aug 1; **122**(8): 54–61.
[Publisher Full Text](#)
- Melchart D, Köhler W, Linde K, *et al.*: **Biomonitoring of mercury in patients with complaints attributed to dental amalgam, healthy amalgam bearers, and amalgam-free subjects: a diagnostic study.** *Clin. Toxicol (Phila).* 2008 Jan 1; **46**(2): 133–140.
[Publisher Full Text](#)
- Minamata Convention: 2014.
[Reference Source](#)
- Molin C: **Amalgam – Fact and fiction** *Scand J Dent Res.* 1992 Feb; **100**(1): 66–73.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Mosteller JH: **Restoration of teeth with silver amalgam.** *J. Prosthet. Dent.* 1961 Mar 1; **11**(2): 288–297.
[Publisher Full Text](#)
- National Institute of Health: **Studies Evaluate Health Effects of Dental Amalgam Fillings in Children.** 2006. [Accessed on 2020 Dec 21].
[Reference Source](#)
- Nayak PP: **Community Social Responsibility of Continued and Appropriate Use of Silver Amalgam as Dental Restorative Material in Southern India.** OSF. August 24. [Data set]. 2022.
[Publisher Full Text](#)
- Peretz B, Ram D: **Restorative material for children's teeth: preferences of parents and children.** *J. Dent. Child.* 2002 Sep 1; **69**(3): 243–248.

Rahman Z, Singh VP: **Assessment of heavy metal contamination and Hg-resistant bacteria in surface water from different regions of Delhi, India.** *Saudi J. Biol. Sci.* 2018 Dec 1; **25**(8): 1687–1695.

[PubMed Abstract](#) | [Publisher Full Text](#)

Reddy P, Krithikadatta J, Srinivasan V, *et al.*: **Dental caries profile and associated risk factors among adolescent school children in an urban South-Indian city.** *Oral Health Prev. Dent.* 2020; **18**(1): 379–386.

[PubMed Abstract](#) | [Publisher Full Text](#)

Ritchie KA, Burke FJ, Gilmour WH, *et al.*: **Mercury vapour levels in dental practices and body mercury levels of dentists and controls.** *Br. Dent. J.* 2004; **197**: 625–632.

[PubMed Abstract](#) | [Publisher Full Text](#)

Roulet JF: **Benefits and disadvantages of tooth-coloured alternatives to amalgam.** *J. Dent.* 1997 Nov 1; **25**(6): 459–473.

[PubMed Abstract](#) | [Publisher Full Text](#)

Spencer AJ: **Dental amalgam and mercury in dentistry.** *Aust. Dent. J.* 2000 Dec; **45**(4): 224–234.

[Publisher Full Text](#)

SCHER, Opinion on Environmental Risks and Indirect Health Effects of Mercury from Dental Amalgam: 2014; page 4. [Accessed on 2020 Dec 21].

[Reference Source](#)

Ukrainian Religious Studies: **The Final Act of the Conference on Security and Cooperation in Europe.** 1996 Sep 27; (2): 71. [Accessed on 2020 Dec 21].

Uçar Y, Brantley W: **Biocompatibility of dental amalgams.**

Biocompatibility of Dental Biomaterials. Woodhead Publishing; 2017; (pp. 95–111).

Umesi DC, Oremosu OA, Makanjuola JO: **Amalgam phase down: baseline data preceding implementation in Nigeria.** *Int. Dent. J.* 2020 Jun 1; **70**(3): 161–166.

[PubMed Abstract](#) | [Publisher Full Text](#)

U.S. Food and Drug Administration: **About Dental Amalgam Fillings.** 2020. [Accessed on 2020 Dec 11].

[Reference Source](#)

Vasthare R: **Community Social Responsibility of continued and appropriate use of Silver Amalgam as dental restorative material in Southern India.** 2022, July 8.

[Publisher Full Text](#)

Weiner JA, Nylander M, Berglund F: **Does mercury from amalgam restorations constitute a health hazard?** *Sci. Total Environ.* 1990 Dec 1; **99**(1-2): 1122.

[PubMed Abstract](#) | [Publisher Full Text](#)

Woods JS, Martin MD, Leroux BG, *et al.*: **Biomarkers of kidney integrity in children and adolescents with dental amalgam mercury exposure: findings from the Casa Pia children's amalgam trial.** *Environ. Res.* 2008 Nov 1; **108**(3): 393–399.

[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)

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Current Peer Review Status:   

Version 5

Reviewer Report 29 July 2024

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Nourdine Attiya 

Moulay Ismail University, Meknes, Morocco

Dear Authors,

Thank you for your continued efforts in revising the manuscript titled "Community Social Responsibility of Continued and Appropriate Use of Silver Amalgam as Dental Restorative Material in Southern India: A Cross-Sectional Study." While significant improvements have been made, there are critical areas that still require attention to enhance the quality and comprehensiveness of the manuscript.

Key Points for Further Revision:

1. Finite Population Correction (FPC):

- **Current Status:** The manuscript lacks the application of the finite population correction (FPC) despite known population and sample sizes. The response mentioned difficulty in sample size estimation, which seems unrelated to applying FPC.
- **Recommendation:** Please clarify the rationale behind not using FPC, particularly given its importance in small populations. If applicable, incorporate FPC into the descriptive statistical analysis to improve the precision and credibility of your results.

2. Focus on Dental Amalgam and Its Health Impacts controversies:

- **Current Status:** The manuscript currently emphasizes the official position on dental amalgam without a comprehensive review of its health impacts.
- **Recommendation:** The literature review should include a thorough discussion on the health effects of mercury exposure from dental amalgam, especially concerning dental personnel. It is important to acknowledge studies that highlight potential risks, even if they are not aligned with official positions. Some relevant studies (from many others) include:
 - Florina Andreescu C, 2017 (Ref 1)
 - Neghab M, et. al., 2011 (Ref 2)
 - Moen B, et. al., 2008 (Ref 3)
- A balanced view of the risks and benefits associated with dental amalgam use will

enhance the manuscript's comprehensiveness and relevance and guarantees its neutrality.

3. Clarity and Repetition:

- **Recommendation:** Avoid repetition and ensure clarity in the language. For example, the phrase "Shapiro-Wilk test was done was performed" should be corrected to "the Shapiro-Wilk test was performed."

References

1. Florina Andreescu C: Neurotoxic effects of mercury exposure for dental workers - A literature review. *Dental, Oral and Craniofacial Research*. 2017; **3** (4). [Publisher Full Text](#)
2. Neghab M, Choobineh A, Hassan Zadeh J, Ghaderi E: Symptoms of intoxication in dentists associated with exposure to low levels of mercury. *Ind Health*. 2011; **49** (2): 249-54 [PubMed Abstract](#) | [Publisher Full Text](#)
3. Moen B, Hollund B, Riise T: Neurological symptoms among dental assistants: a cross-sectional study. *J Occup Med Toxicol*. 2008; **3**: 10 [PubMed Abstract](#) | [Publisher Full Text](#)

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Epidemiology, Environmental health, Biostatistical modeling

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 29 July 2024

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Ramkumar Yadav

Department of Biomaterials Science, College of Dentistry,, Dankook University, Yongin-si, Gyeonggi-do, South Korea

All comments have been answered by the authors.
No further comments.

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 4

Reviewer Report 10 June 2024

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**Ramkumar Yadav**

Department of Biomaterials Science, College of Dentistry,, Dankook University, Yongin-si, Gyeonggi-do, South Korea

Why did authors work on DA materials still.
Add Dental composite history also.
Add current limitations of work.
Add futute scope of this work.
Why did authors not perform mechanical test.
Why did authors not perform physical test.
Why did authors not perform thermal test.
Why did authors not perform wear test.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Dental composite materials

I confirm that I have read this submission and believe that I have an appropriate level of

expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 20 Jun 2024

Prajna Nayak

Reviewer 3 report and Author responses:

Why did authors work on DA materials still.

Response: We thank the reviewer for this relevant question. A survey among dental practitioners regarding continued usage of DA is relevant in India as dental amalgam is still widely used across the Indian subcontinent. The extensive usage of DA in many parts of India prompted us in conducting this survey to understand their perception of continued usage as well as their concerns on mercury toxicity.

Add Dental composite history also.

Response: We thank the reviewer for the suggestion, but we wish to mention that the introduction is already very long and a detailed history about the dental amalgam, which is in accordance with the aim of this study, is already mentioned. Hence we will not be able to add history on dental composites.

Add current limitations of work.

Response: We have added the limitations of this study at the end of the discussion section in the page #13.

Add future scope of this work.

Response: Thank you Sir for this suggestion we have now added this in second paragraph of the conclusion section in the page #13.

Why did authors not perform mechanical test.

Why did authors not perform physical test.

Why did authors not perform thermal test.

Why did authors not perform wear test.

Response: Respected Sir, this was only a survey done using a questionnaire, among the dental practitioners about their perception on dental amalgam usage. Hence no physical, mechanical or wear tests were done.

Competing Interests: Authors do not have any conflicts of interest

Reviewer Report 28 May 2024

<https://doi.org/10.5256/f1000research.164158.r269658>

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Nourdine Attiya 

Moulay Ismail University, Meknes, Morocco

Dear Authors,

I hope this message finds you well. Thank you for your diligent efforts in revising the manuscript titled "Community Social Responsibility of Continued and Appropriate Use of Silver Amalgam as Dental Restorative Material in Southern India: A Cross-Sectional Study." After thoroughly reviewing the revised version, I appreciate the improvements made so far. However, several methodological concerns need to be addressed to ensure the robustness and transparency of your study.

Key Points for Further Revision:

1. Population Size and Sampling Method:

- **Current Status:** The revised methods section includes details on the small population size and the use of complete enumeration.
- **Recommendation 1:** Explicitly state any limitations related to sample size, potential biases, and the generalizability of findings in a dedicated paragraph in the discussion section.
- **Recommendation 2: Finite Population Correction (FPC):** If applicable, include the finite population correction factor in the descriptive statistical analysis section. This adjustment is crucial for small populations and should be transparently reported to strengthen the credibility of the findings.

2. Statistical Analysis Transparency:

- **T-Test and Chi-Square Test Assumptions:**
 - **T-Test:** The manuscript now includes information on the assumptions for the t-test.
 - **Chi-Square Test:** The assumptions for the chi-square test, particularly the need for independence of observations and the requirement that expected frequencies be at least 5, have not been discussed.
- **Recommendation:** Please discuss how the assumptions for both the t-test and chi-square test were verified. For the chi-square test, specifically confirm that all expected frequencies met the minimum requirement.

3. Confidence Intervals for Descriptive Statistics:

- **Current Status:** The response indicates a misunderstanding about the applicability of confidence intervals for proportions. My suggestion was to estimate CIs for the descriptive statistics summarized in the first three tables, not specifically for hypothesis tests.
- **Recommendation:** Confidence intervals should be calculated and presented for the descriptive statistics (proportions and means) summarized in Tables 1-3. This will enhance the interpretability and reliability of your estimates. Confidence intervals can and should be calculated for proportions and are a standard practice in statistical analysis to express the precision of an estimate. Providing confidence intervals for proportions, and not only means, would strengthen the presentation of your results by offering a range within which the true population proportion is likely to lie. This enhances the interpretability and reliability of your findings.

If there are specific reasons or constraints that will prevent you from including confidence intervals for proportions, it would be helpful to elaborate on these in the manuscript. Otherwise, I strongly recommend incorporating confidence intervals for the proportions presented in your results section to improve the completeness and robustness of your statistical analysis.

Conclusion:

While the manuscript has shown significant improvements, addressing the above points will further enhance its methodological rigor and overall quality. Including discussions on the chi-square test assumptions, providing confidence intervals for descriptive statistics, and ensuring detailed discussion on the study limitations will make your manuscript more robust and transparent.

Thank you for your attention to these points. I look forward to seeing the revised version of your manuscript.

Best regards,

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Epidemiology, Environmental health, Biostatistical modeling

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 22 Jun 2024

Prajna Nayak

We would like to thank the reviewer for spending their valuable time and providing us with their valuable comments and suggestions. We have tried to address the comments and revised the manuscript accordingly. The changes in the manuscript have been highlighted in yellow.

Reviewer Comment:

1. Population Size and Sampling Method:

Current Status: The revised methods section includes details on the small population size and the use of complete enumeration.

Recommendation 1: Explicitly state any limitations related to sample size, potential biases, and the generalizability of findings in a dedicated paragraph in the discussion section.

Recommendation 2: Finite Population Correction (FPC): If applicable, include the finite population correction factor in the descriptive statistical analysis section. This adjustment is crucial for small populations and should be transparently reported to strengthen the credibility of the findings.

Author Response: We thank the reviewer for the suggestion, we have now explicitly mentioned the same.

Respected ma'am, as it was not possible to estimate the sample size, further incorporating the criteria of Finite Population Correction was not considered.

Reviewer Comment:

2. Statistical Analysis Transparency:

T-Test and Chi-Square Test Assumptions:

T-Test: The manuscript now includes information on the assumptions for the t-test.

Chi-Square Test: The assumptions for the chi-square test, particularly the need for independence of observations and the requirement that expected frequencies be at least 5, have not been discussed.

Recommendation: Please discuss how the assumptions for both the t-test and chi-square test were verified. For the chi-square test, specifically confirm that all expected frequencies met the minimum requirement.

Author Response: We have now applied Fisher's Exact Test as a replacement of Chi-square test, since the expected frequencies of few cells were less than 5. (Table 5).

For table 4, where T-test was applied, we have mentioned the following in Page 6: 'Since the sample was small, Shapiro Wilk test was done was performed, which did not show evidence of non-normality ($W = 0.78$, $p\text{-value} = 0.26$).'

Reviewer Comment:

3. Confidence Intervals for Descriptive Statistics:

Current Status: The response indicates a misunderstanding about the applicability of confidence intervals for proportions. My suggestion was to estimate CIs for the descriptive statistics summarized in the first three tables, not specifically for hypothesis tests.

Recommendation: Confidence intervals should be calculated and presented for the descriptive statistics (proportions and means) summarized in Tables 1-3. This will enhance the interpretability and reliability of your estimates. Confidence intervals can and should be calculated for proportions and are a standard practice in statistical analysis to express the precision of an estimate. Providing confidence intervals for proportions, and not only means, would strengthen the presentation of your results by offering a range within which the true population proportion is likely to lie. This

enhances the interpretability and reliability of your findings.

If there are specific reasons or constraints that will prevent you from including confidence intervals for proportions, it would be helpful to elaborate on these in the manuscript. Otherwise, I strongly recommend incorporating confidence intervals for the proportions presented in your results section to improve the completeness and robustness of your statistical analysis.

Author Response: Thank you, ma'am, for suggestion. We have now added Confidence Intervals for proportions. (Tables 1 & 2)

Competing Interests: Authors do not have any competing interests

Version 3

Reviewer Report 19 January 2024

<https://doi.org/10.5256/f1000research.159529.r229119>

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Nourdine Attiya 

Moulay Ismail University, Meknes, Morocco

Dear Authors',

I hope this message finds you well. Thank you for your continued efforts in revising the manuscript titled "Community social responsibility of continued and appropriate use of silver amalgam as dental restorative material in southern India: A cross-sectional study." I have thoroughly reviewed the revised version and would like to emphasize certain methodological concerns that, unfortunately, remain unaddressed:

Methods:

1. Population Size and Sampling Method:

- The revised methods section still lacks essential information regarding the population size and the sampling method. This omission hampers the ability of readers to evaluate the generalizability of the study findings. Including these details is crucial for the overall transparency and robustness of your research.

2. Statistical Analysis Transparency:

- I appreciate the clarity in your statistical analysis section. However, the revised manuscript does not mention whether all assumptions for the t-test and especially for the chi-square test were checked before application. Reporting on these checks and addressing any violations would significantly enhance the methodological transparency of your study.

- The authors mentioned that perception and awareness for DA use as a risk factor were treated as continuous variables for analysis using Student's t-test. However, the manuscript lacks clarification on the specific transformation method employed to convert these variables into continuous form. Providing details on this transformation process would enhance the transparency and replicability of the study's statistical analysis

3. Confidence Intervals:

- While proportions are presented in the results section, the absence of confidence intervals limits the precision of the estimates. Signaling this limitation in the discussion is not sufficient to accept it. Providing insights into the real reasons behind this absence is crucial and would strengthen the methodological rigor of your study.

On another hand, the revised version of the article has addressed some aspects of the initial concerns, but there are still areas that could be further refined:

1. Neutrality and Balance:

- The authors have made slight revisions to the language, but there is room for improvement in achieving a more neutral tone.

2. Inclusion of Opposing Views:

- The manuscript still lacks explicit inclusion of opposing viewpoints or critical studies on dental amalgam use. Enhancing the literature review with such perspectives would contribute to a more balanced overview.

3. Clarity and Flow:

- While the manuscript maintains an acceptable reading flow, some sentences could be simplified for clarity. Revisiting sentence structures and avoiding unnecessary repetition would enhance communication.

While there has been some improvement, it seems that the initial concerns were not fully addressed in the revised submitted manuscript.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Epidemiology, Environmental health, Biostatistical modeling

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 22 Mar 2024

Prajna Nayak

Firstly, we would like to thank the reviewers for spending their valuable time and providing us with their valuable comments and suggestions. We truly appreciate your guidance in improving our work. We have tried to address the comments and revised the manuscript accordingly.

Reviewer report and Author responses

1. Introduction:

Neutrality and Balance:

The authors have made slight revisions to the language, but there is room for improvement in achieving a more neutral tone.

Response: Respected ma'am, we have now revised achieve a more neutral tone.

Inclusion of Opposing Views:

The manuscript still lacks explicit inclusion of opposing viewpoints or critical studies on dental amalgam use. Enhancing the literature review with such perspectives would contribute to a more balanced overview.

Response: We thank the reviewer for the suggestion, we have now added 6 more recent studies, ma'am:

No correlations were found between exposure to DA and neuropsychological and renal functions in children and adults in many randomized trials done all over the world.

[Bellinger DC et al, 2006; Barregard L, Trachtenberg F and McKinlay S, 2008; Lauterbach M et al, 2008]. A systematic review and meta-analysis was conducted for three case control studies and one cohort study but did not provide evidence for or against an association between the presence of DA restorations and multiple sclerosis. [Aminzadeh KK, Etminan M, 2008].

Studies did not find any association between urinary mercury concentrations among dentists and dental nurses with self-reported memory disturbance or mercury vapors in the dental office with cytogenetic damage to leukocytes. [Ritchie KA et al, 2004; Atesagaoglu A et al, 2004].

Clarity and Flow:

While the manuscript maintains an acceptable reading flow, some sentences could be simplified for clarity. Revisiting sentence structures and avoiding unnecessary repetition would enhance communication.

Response: We have now made the corrections, ma'am.

3. Methods:

Population Size and Sampling Method:

The revised methods section still lacks essential information regarding the population size and the sampling method. This omission hampers the ability of readers to evaluate the

generalizability of the study findings. Including these details is crucial for the overall transparency and robustness of your research.

Response: Since it was a small population size, we included all practitioners, and hence, sampling was not done, ma'am. Total population size (complete enumeration) is taken into the study. This is mentioned in the 2nd and 5th paragraphs of 'Study design' and 1st paragraph of results section.

(population size:134 dental practitioners, those following inclusion and exclusion criteria: 92, Responses: 52) Since it was a small population size, we have included all practitioners, and hence, no sampling was done.

Statistical Analysis Transparency:

I appreciate the clarity in your statistical analysis section. However, the revised manuscript does not mention whether all assumptions for the t-test and especially for the chi-square test were checked before application. Reporting on these checks and addressing any violations would significantly enhance the methodological transparency of your study.

The authors mentioned that perception and awareness for DA use as a risk factor were treated as continuous variables for analysis using Student's t-test. However, the manuscript lacks clarification on the specific transformation method employed to convert these variables into continuous form. Providing details on this transformation process would enhance the transparency and replicability of the study's statistical analysis.

Response: We regret the error in 'statistical analysis section' ma'am. We have now done the corrections.

Perception and awareness for DA use as a risk factor were analyzed using chi-square test. (as seen in the table)

Preferences for continuation of use of silver amalgam based upon the age of dentists had continuous variables (age), so analysis was done using Students t-test. (Table 4)

All the other analysis were done using chi-square test, as they were proportions.

4. Results:

Confidence Intervals:

While proportions are presented in the results section, the absence of confidence interval limits the precision of the estimates. Signaling this limitation in the discussion is not sufficient to accept it. Providing insights into the real reasons behind this absence is crucial and would strengthen the methodological rigor of your study.

Response: Thank you, ma'am, since Confidence Intervals can be given for continuous variables, and not proportions, we have now added this in Table 4.

Competing Interests: Nil

Version 2

Reviewer Report 27 November 2023

<https://doi.org/10.5256/f1000research.139800.r225243>

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Nourdine Attiya 

Moulay Ismail University, Meknes, Morocco

I have had the opportunity to thoroughly review the research article titled: "**Community social responsibility of continued and appropriate use of silver amalgam as dental restorative material in southern India: A cross-sectional study**", submitted for consideration to F1000Research and I would like to raise several points that, in my view, require careful consideration and clarification.

1. Introduction:

The introduction provides a comprehensive historical background on dental amalgam, highlighting its significance and controversies. However, there seems to be a lack of neutrality in the language, particularly in statements like "We observed that DA is receiving undue attention and controversies." This may give the impression of bias and could be addressed for a more balanced tone.

2. Literature Review:

While the literature review touches upon the controversies surrounding dental amalgam, it appears to be somewhat one-sided. It would be beneficial to include key studies or viewpoints that are critical of amalgam use to provide a more comprehensive overview of the current landscape. Moreover, I observed that the bibliography includes references that are somewhat dated. Given the dynamic nature of research in this field, it is essential to incorporate the most recent and pertinent literature to enhance the credibility and relevance of the study.

3. Methods:

- The methods section is clear, but there is a lack of information regarding the population size and the sampling method. Including these details is crucial for readers to assess the generalizability of the study findings and understand how the sample was selected and if it is representative of the sought population.
- Additionally, the statistical analysis section does not mention whether assumptions for the t-test (normality, homoscedasticity) and chi-square test (expected frequencies in each cell are not too small, especially for variables with multiple categories) were checked before application. Reporting on these checks and how violations, if any, were addressed would enhance the transparency of the study.

4. Results:

The results section presents proportions without confidence intervals. The absence of confidence intervals limits the ability to gauge the precision of the estimates. In the discussion, it would be beneficial to acknowledge and explain this limitation.

5. Discussion & conclusion:

- While the discussion is comprehensive, it would be helpful to emphasize the strengths and positive aspects of dental amalgam, providing a more balanced view.
- The use of a specific commercial product name in the conclusion (Ivoclar Cention N) raises ethical considerations. Scientific research should prioritize objectivity, and care should be taken to avoid any perception of endorsing or promoting a specific company's product.
- The conclusion rightly emphasizes the need for a calculated decision in selecting the right restorative material. However, it would be beneficial to reiterate key recommendations (promoted by the Minamata convention and several organizations), such as the importance of education on mercury hygiene and waste management.

Finally, throughout the article, I think that clarity and conciseness could be enhanced by revisiting sentence structures and avoiding unnecessary repetition. Moreover, neutrality in presenting the dental amalgam controversial scientific debate is recommended.

Is the work clearly and accurately presented and does it cite the current literature?

No

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

No

If applicable, is the statistical analysis and its interpretation appropriate?

No

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Epidemiology, Environmental health, Biostatistical modeling

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 06 Dec 2023

Prajna Nayak

Firstly, we would like to thank the reviewer for spending their valuable time and providing

us with their valuable comments and suggestions. We truly appreciate your guidance in improving our work. We have tried to address the comments and revised the manuscript accordingly.

Reviewer report and Author responses

1. Introduction:

The introduction provides a comprehensive historical background on dental amalgam, highlighting its significance and controversies. However, there seems to be a lack of neutrality in the language, particularly in statements like "We observed that DA is receiving undue attention and controversies." This may give the impression of bias and could be addressed for a more balanced tone.

Response: Respected ma'am, we have now modified it.

2. Literature Review:

While the literature review touches upon the controversies surrounding dental amalgam, it appears to be somewhat one-sided. It would be beneficial to include key studies or viewpoints that are critical of amalgam use to provide a more comprehensive overview of the current landscape. Moreover, I observed that the bibliography includes references that are somewhat dated. Given the dynamic nature of research in this field, it is essential to incorporate the most recent and pertinent literature to enhance the credibility and relevance of the study.

Response: We have now added 3 more recent studies, ma'am. We have also attempted to give the dual stance of organizations and research works done and tried to explain both standpoints.

3. Methods:

The methods section is clear, but there is a lack of information regarding the population size and the sampling method. Including these details is crucial for readers to assess the generalizability of the study findings and understand how the sample was selected and if it is representative of the sought population.

Response: Total population size is mentioned in the 2nd paragraph of 'Study design' (population size:134 dental practitioners).

Since it was a small population size, we have included all practitioners, and hence, no sampling was done.

Additionally, the statistical analysis section does not mention whether assumptions for the t-test (normality, homoscedasticity) and chi-square test (expected frequencies in each cell are not too small, especially for variables with multiple categories) were checked before application. Reporting on these checks and how violations, if any, were addressed would enhance the transparency of the study.

Response: We have now added on the normality of the data.

4. Results:

The results section presents proportions without confidence intervals. The absence of confidence intervals limits the ability to gauge the precision of the estimates. In the discussion, it would be beneficial to acknowledge and explain this limitation.

Response: We have now mentioned ma'am

5. Discussion & conclusion:

While the discussion is comprehensive, it would be helpful to emphasize the strengths and positive aspects of dental amalgam, providing a more balanced view.

Response: We have briefly mentioned the strengths of dental amalgam in the 1st paragraph and limitations in the 3rd paragraph of discussion

The use of a specific commercial product name in the conclusion (Ivoclar Cention N) raises ethical considerations. Scientific research should prioritize objectivity, and care should be taken to avoid any perception of endorsing or promoting a specific company's product.

Response: Thank you for drawing attention towards this. We have now removed the brand names, ma'am.

The conclusion rightly emphasizes the need for a calculated decision in selecting the right restorative material. However, it would be beneficial to reiterate key recommendations (promoted by the Minamata convention and several organizations), such as the importance of education on mercury hygiene and waste management.

Response: We have now rectified it, ma'am.

Finally, throughout the article, I think that clarity and conciseness could be enhanced by revisiting sentence structures and avoiding unnecessary repetition. Moreover, neutrality in presenting the dental amalgam controversial scientific debate is recommended.

Response: We have now attempted and appraised, ma'am.

Competing Interests: No competing interests were disclosed.

Reviewer Report 02 November 2022

<https://doi.org/10.5256/f1000research.139800.r154244>

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Manjunath P Puranik 

Department of Public Health Dentistry, Government Dental College and Research Institute, Bangalore, Karnataka, India

Revision is satisfactory.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Public Health Dentistry

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 06 October 2022

<https://doi.org/10.5256/f1000research.134713.r150726>

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Manjunath P Puranik

Department of Public Health Dentistry, Government Dental College and Research Institute, Bangalore, Karnataka, India

1. Abstract - *"In spite of satisfaction with DA for its minimal failure, longevity and affordability, the authors found that a majority of practitioners did not prefer its continued usage."* - There is a contradiction in their practice, perceptions and preferences. This has to be explained in the discussion.
2. Abstract - *"Dentists with higher age and longer clinical experience preferred continuation of DA."* - Is it because of lack of awareness or any other reason? This has to be explained in the discussion.
3. Abstract - *"There is also an urgent need to educate dentists on mercury hygiene, mercury waste*

management and disposal." - Will this help dentists with higher age and longer clinical experience who preferred continuation of DA? This has to be explained in the discussion.

4. Abstract - "*This highlights their concerns over mercury toxicity and soft tissue lesions and accentuates their community social responsibility.*" - How does it accentuate their community social responsibility? This has to be explained in the discussion.
5. Introduction - is extensive and informative about the stance of dental amalgam usage by various organizations around the world. Since the study is among individual dentists, the review demands the addition of such information if there is any in the existing literature and justifies the need for the study.
6. Discussion - there is a need to discuss community social responsibility since it is mentioned in the title.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Public Health Dentistry

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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