

Knowledge, Attitude, and Practice of Amalgam Restorations in Undergraduate Dental Students

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Abstract:

Background: Amalgam has been used in dentistry as direct restorative material of posterior teeth for many years. It is the most cost-effective restoration with easy application, and has strength, durability and bacteriostatic effect. However, the use of this material is decreasing these days due to the increasing concerns regarding detrimental health effects, environmental hazards and aesthetics. Although there are concerns regarding mercury toxicity, most dental institutions hold amalgam as the material of choice for undergraduate students. **Aim:** To assess the knowledge, attitude and practice of dental amalgam as a restorative material among the undergraduate dental students and interns. **Materials and method:** Study was conducted as a cross sectional questionnaire based study among the undergraduate dental students of VSPM dental college. **Results:** Majority of them are aware about amalgam controversy (93.2%) and about protocols of amalgam disposal (62.3%). Majority of the students think that amalgam should not be used as final restoration (64.3%), it is unsafe (68%) and should be banned (66.7%).. Majority (77.7%) of them don't place rubber dam, don't use any type of evacuation method and don't use mercury spill kit (74.3%). Most (68.3%) of them dispose amalgam contaminated cotton and gloves with other biomedical waste followed by regular dustbin (31%). **Conclusion:** The undergraduates have adequate knowledge about amalgam composition, controversy and its disposal methods. Most of them feel that the use of amalgam should be banned and discontinued due to environmental and health concerns due to mercury toxicity, yet it still remains controversial

Key Word: Amalgam; knowledge; attitude; practice; disposal; ban; mercury toxicity

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I. Introduction

Amalgam has been used in Dentistry for about 150 to 200 years and is still under use due to its low cost, ease of application, strength and durability [1]. It is an alloy of mercury. Amalgam consists of an alloy of silver, copper, tin and zinc combined with mercury. Modern amalgams are available in capsule form that consists of 45% of mercury. There are several advantages of pre capsulated amalgams that include convenience in use, reduction or sometimes there is no evidence of amalgam spill during mixing [2]. The release of amalgam particles into dental office wastewater is a matter of particular concern as amalgam particles could then be discharged into the environment. Amalgam waste discharges contribute to mercury in the environment through direct wastewater discharge, incineration, land-filling and sewage sludge incineration, although the discharge from dentistry is probably responsible for less than 1% of the total mercury discharged annually into the environment as a result of human activities. Nevertheless, dentists, by being producers of amalgam waste, have a responsibility and a duty of care for the proper management of this waste within their practices. Appropriate measures should be taken to minimize the amount of waste where possible or take action to ensure that all generated waste is disposed of in accordance with environmental legislation [3]. In the year 1843, American Society of Dental Surgeons declared the use of dental amalgam to be malpractice due to the fear of mercury poisoning both in patients and dentists. Studies were done to assess the mercury level in urine of patients and dentists. This led to the emergence of amalgam war. Three amalgam wars have been reported in the years 1845, 1926 and 1980s respectively. Few patients have reported allergic reactions due to amalgam restorations [4]. The development of various tooth coloured cements and resins serves as an alternative and have reduced the use of amalgam. Glass ionomer cements preferably in children are used for biocompatibility, fluoride releasing

property and ease of manipulation. Composites have made a complete change in the trend from extension for prevention to a versatile material in the restorative field [5]. They are highly preferred by both patients and dentists for the aesthetics and conservative cavity preparation. Among all these developments in restorative materials, amalgam still stands as one of the excellent restorative materials; some studies continue to support the position that dental amalgam is a safe restorative material [prevention of extension. Particularly flowable composites have become a versatile material in the restorative field [1]. Dental amalgam can be a good choice wherever caries extends towards root since composite restorations in those cases fails due to poor bonding to the dentin or cementum. In certain cases, secondary caries leads to involvement of pulp which ultimately goes for root canal treatment. We have numerous highly cited publications on well designed clinical trials and lab studies related with different aspects of management of deep caries and root canal treatment procedures [10-24]. Amalgam restorations are indicated wherever resistance against occlusal forces, micro leakage and bonding failures are primarily affecting the lifespan of the restoration (6) This particular aspect of amalgam restorations has initiated a right platform for us to pursue the current study. Our aim is to perform a cross sectional survey among undergraduate students of a private dental school to assess knowledge, awareness and practices about dental amalgam among dental students.

II. Material And Methods

This study was conducted by Department of Conservative dentistry and endodontics at VSPM Dental College, Nagpur and initiated after clearance from the Institutional Ethics Committee of VSPM's Dental College & Research Centre, Nagpur.

- **Study Setting:** Study was conducted as a cross sectional questionnaire based study among the dental students to find out the trend regarding dental amalgam. The study was conducted as an online survey as it is time saving.
- **Study design:** A cross sectional questionnaire based study was conducted to assess the knowledge, attitude and practice of amalgam restorations among the undergraduate dental students.
- **Sample population:** Total 300 dental undergraduate students from second year, third year, final year and interns studying in VSPM's Dental College and Research Centre, Nagpur willingly participated in study and filled the questionnaire.
- **Study Procedure:** A questionnaire was prepared and validated. The study comprised of demographic details such as participants name(optional), year of study, email id and questionnaire comprised of total 15 questions out of which first 5 were based on knowledge next 5 questions based on attitude and the last 5 were based on practice. The inclusion criteria was the dental undergraduate students above the age of 18 who were willing to participate and the population below 18 years and not willing to participate were excluded. The questionnaire was uploaded to online survey administration software, Google forms and was distributed via Whatsapp, Facebook and Instagram among the undergraduate dental students.
- **Data Collection and Tabulation:**

The data were extracted and tabulated in MS Excel sheets with respect to each question and their response.

YEAR	PARTICIPANTS	PERCENTAGE
Interns	70	23.3%
Final year	73	24.3%
Third year	142	47.3%
Second year	15	5.1%

TABLE 1- Year of studying of participants.

Total 300 students participated in the survey. Out of 300 majority were from third year (47.3%). remaining were from final year (24.3%), interns (23.3%) and second year (5.1%).

III. Result

The participants were grouped as per the year of study. (fig.1)

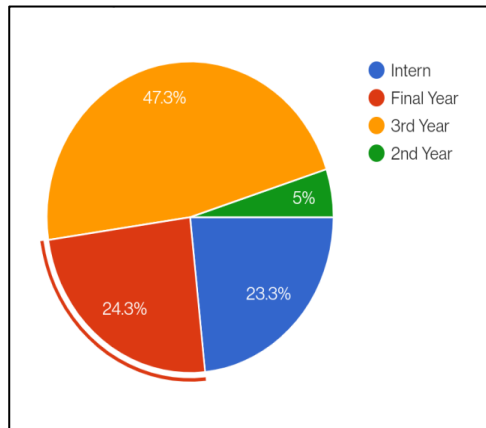


Fig.1 Year of studying of the participants

The pie chart shows that majority of people (98%) know the composition of dental amalgam (fig 2a) and majority (93.2%) of them know that mercury is the harmful element.(Fig2b)

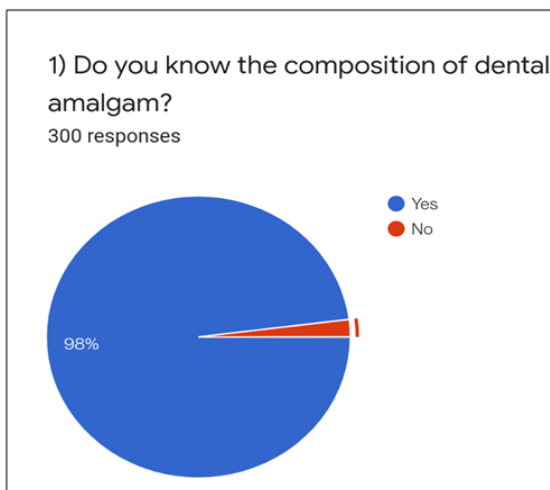


Fig 2a: Composition of dental Amalgam

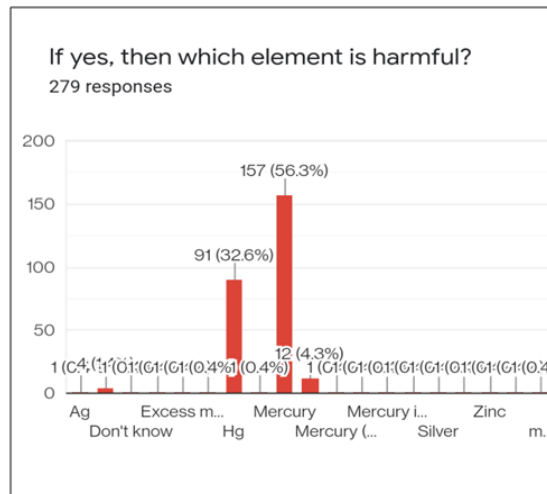


Fig 2b: Harmful element in dental amalgam

Majority of them are aware about amalgam controversy (93.2%)(fig.3)

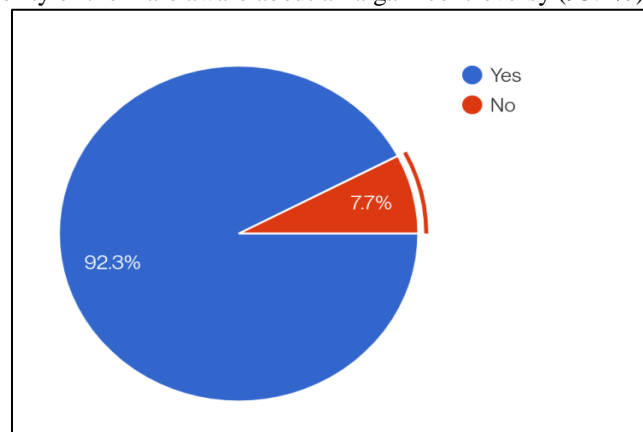


Fig3 awareness about amalgam Controversy

About protocols of amalgam disposal 62.3% students were found to be aware. (fig4)

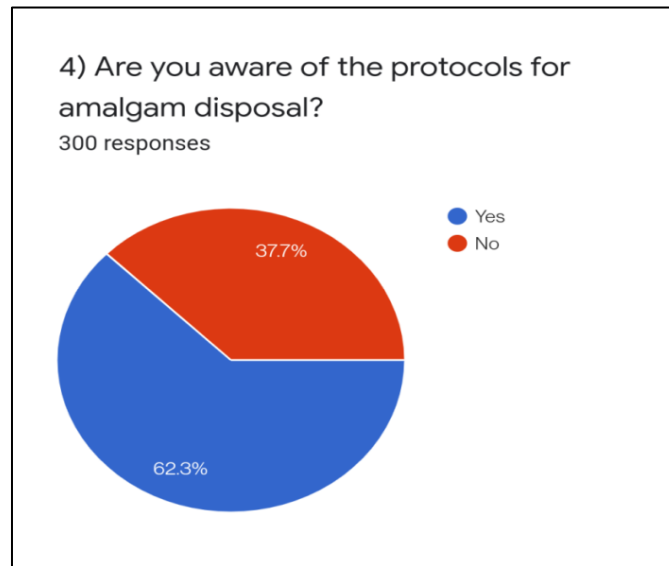


Fig4. Awareness of amalgam disposal protocol

The source of knowledge for the most of them was undergraduate education (68.3%), followed by continuing dental education (12.3%) and colleagues; conferences and patient enquiries play a little role as a source of knowledge for undergraduates.

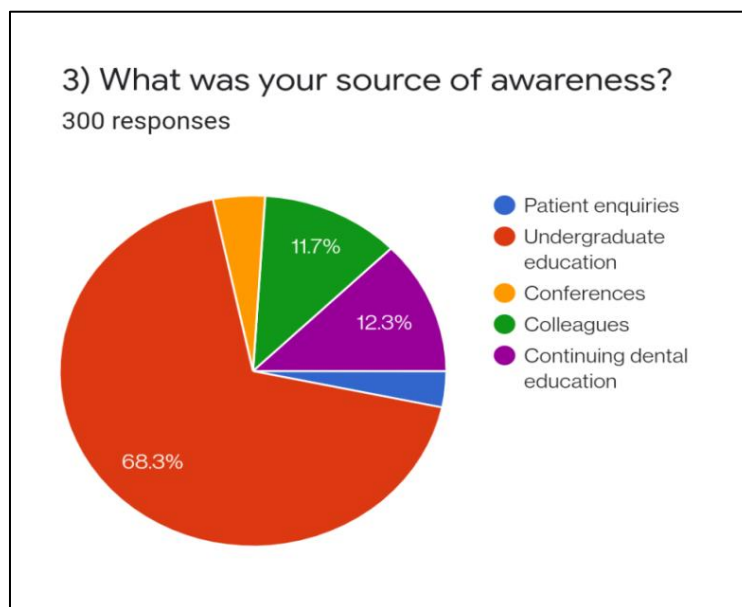


Fig.5. Source of Awareness of amalgam disposal

Mercury toxicity (71.3%) is the major reason followed by aesthetics (25.7%) for the declining use of amalgam in clinical practice.

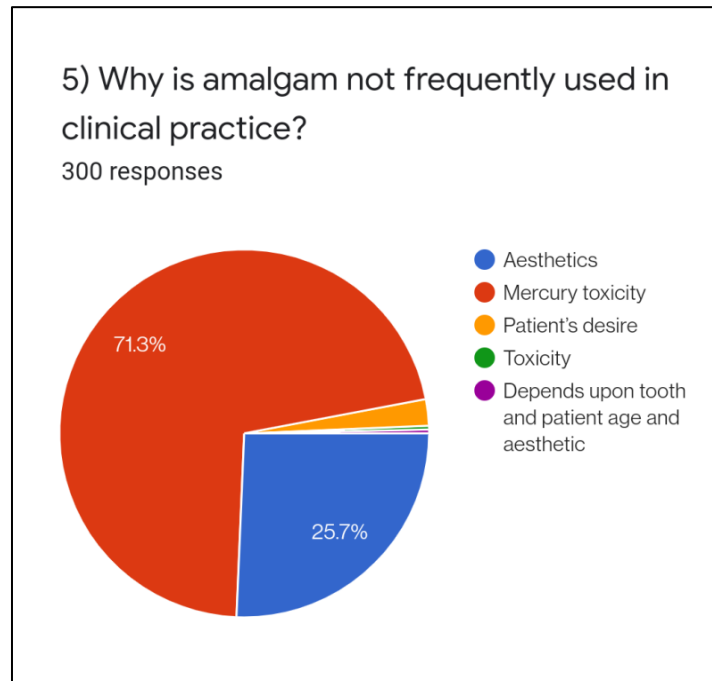


Fig 6: Reasons for declined use of Amalgam in clinical Practice

Majority of the students think that amalgam should not be used as final restoration (64.3%) (fig7)

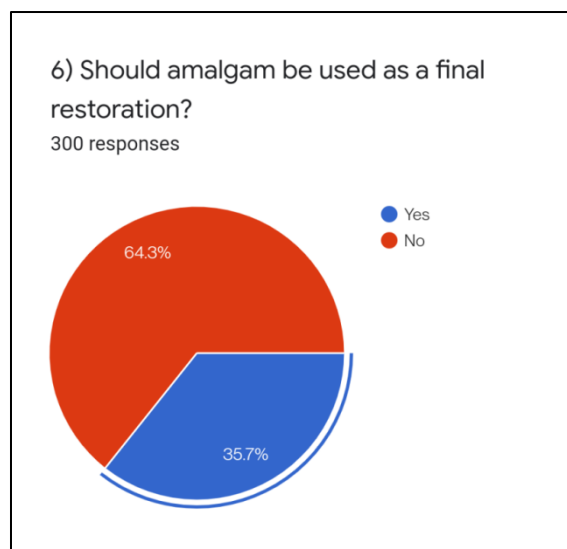


Fig.7. amalgam as final restoration

about 68% of the students think that amalgam is unsafe ((Fig8)

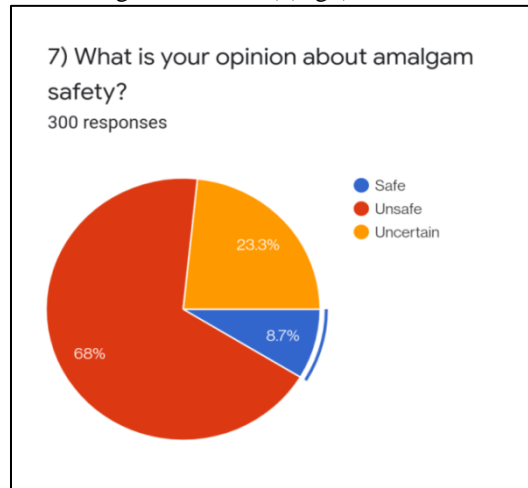


Fig.8 Amalgam safety

And about 66.7% of students support that amalgam should be banned (fig9)

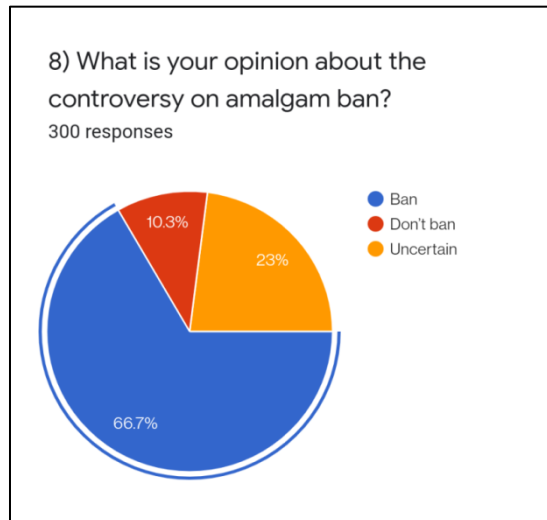


Fig9. Controversy of amalgam ban

Majority of them are bothered about environmental effects (79.7%) of mercury and that it is an occupational risk factor.(fig 10)

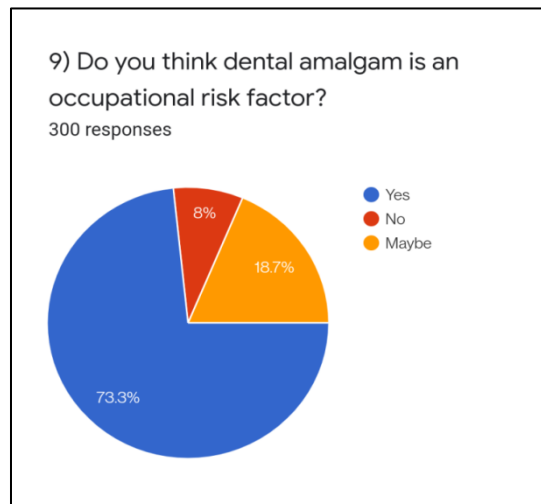


Fig 10.dental amalgam as Occupational hazard

Most of the students (95.3%) are doing amalgam restoration in pre clinics and clinics, anywhere between less than 5 (29.3%), 5-10 restorations (26%). 10-15 (25.7%) and more than 15 (19%). (fig 11a & 11b)

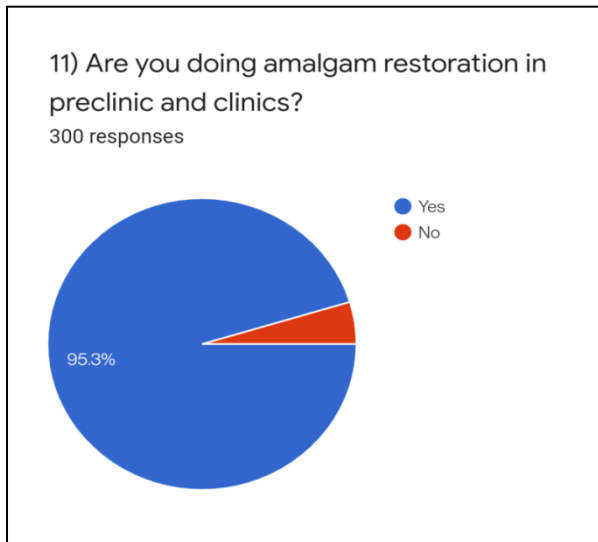


Fig11a .Use of amalgam in pre clinics & clinics

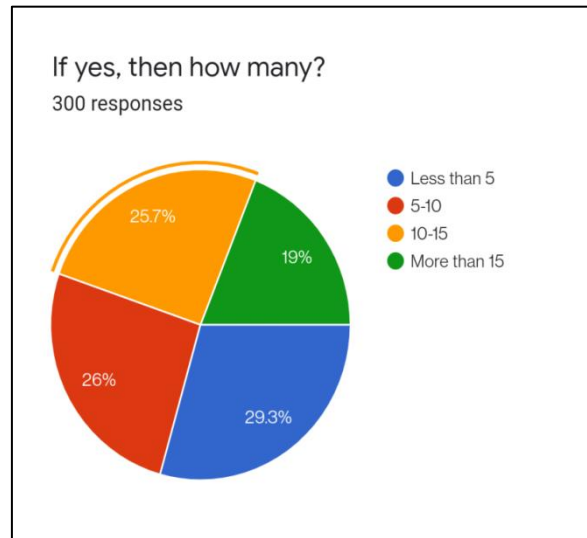


fig.11b.no.of restoration done

Majority (77.7%) of them don't place rubber dam,(fig12) don't use any type of evacuation method(fig13)

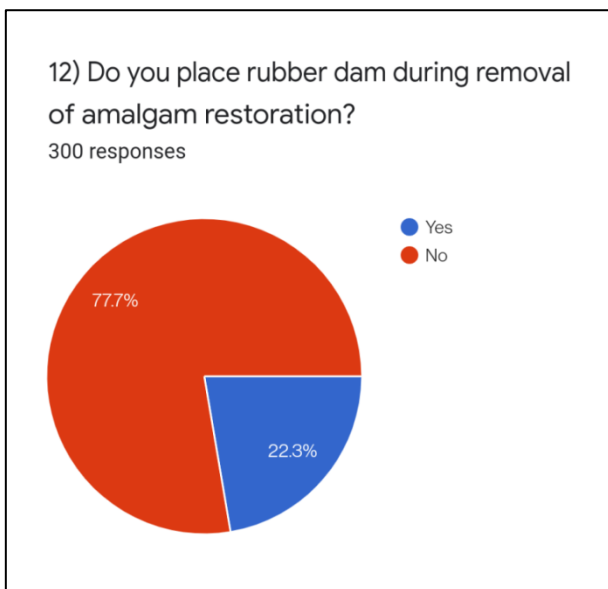


Fig12.rubber dam used for amalgam removal

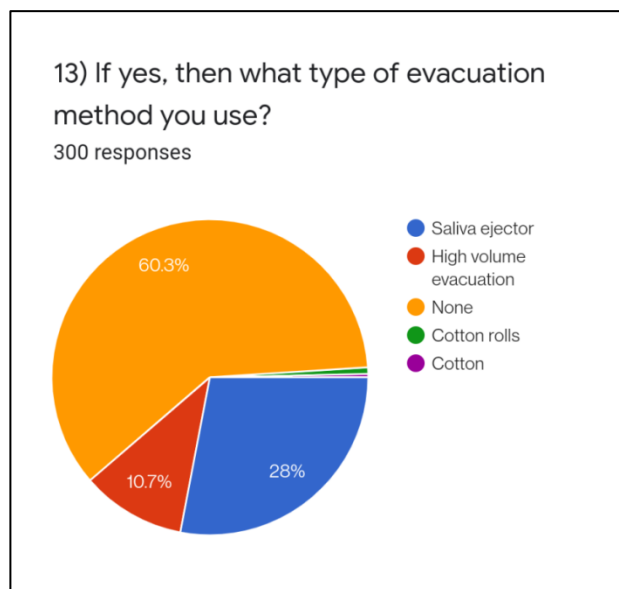


Fig13. Evacuation method use for amalgam

Most of them (68.3%) dispose amalgam contaminated cotton and gloves with other biomedical waste followed by regular dustbin (31%).(fig14) and don't use mercury spill kit (74.3%). (fig.15)

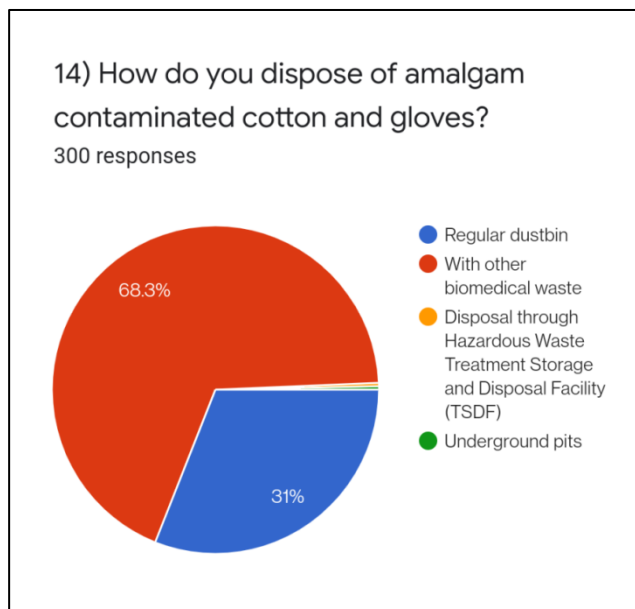


Fig 14 .Disposal of soiled gloves & cotton

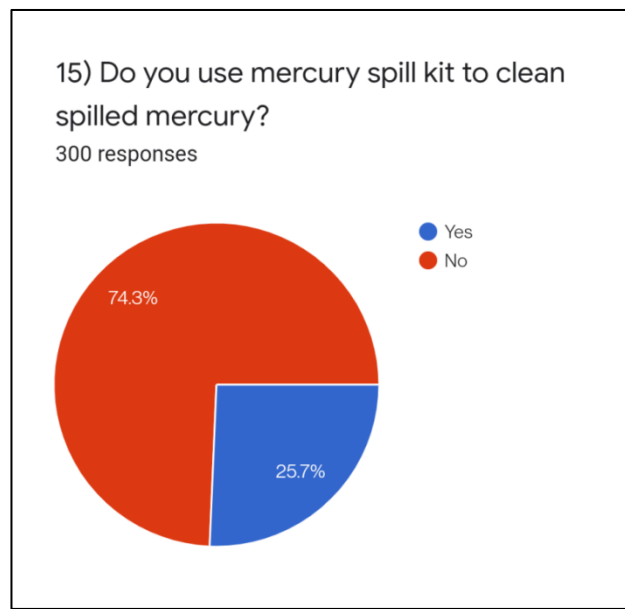


fig 15.Use of mercury spill kit

IV. Discussion

Although many reports on scientific evidence demonstrate amalgam to be a safe and effective restorative material there is a continuous debate since years on use of dental amalgam, degree of mercury release and its potential health effects. [7]. However, there are several big national and international dental organizations stating that mercury fillings are stable [8]. Considering this, a study was conducted to assess the knowledge, attitude and practice of undergraduate students about amalgam restorations in VSPM dental college and research centre, Nagpur, India.

In the present study, most of the participants (294, 98%) knew about the composition of dental amalgam and knew that mercury was the harmful element (248, 93.2%).Majority of the study participants in the current study were aware of amalgam controversy (277,92.3%). Most of them had learned about amalgam war in their undergraduate education (205, 68.3%) which is similar to the source of awareness reported in a study done by Udoje and Aguwa where 82.9% had gained knowledge about it through education in undergraduate education [9]. Majority (187, 62.3%) were aware of the protocols for amalgam disposal.

Most (214, 71.3%) of the participants regarded mercury toxicity as the reason for declining use of amalgam in clinical practice, the second reason was aesthetics (77, 25.7%). Mercury toxicity may result from the inhalation of mercury vapors. Therefore, amalgam containing mercury should be handled with extreme care. The amalgam wastes should not be incinerated or autoclaved because mercury volatilized forming mercury vapors and entering the atmosphere, risking mercury toxicity [10]. Improper handling and disposal of amalgam may lead to substantial threat of the hazardous conditions [11]. Therefore, all the individuals handling dental amalgam should be informed regarding the potential hazards of mercury vapor and trained for good mercury hygiene practices [12]. The risks of adverse health effects in the dental office can be minimized by following the recommended mercury hygiene protocols [13]. Most (193, 64.3%) of the participants thought that amalgam should not be used as final restoration. In this study, most of the study participants (204, 68%) considered amalgam to be an unsafe material. Only a few participants (26, 8.7%) thought this material to be safe and (70, 23.3%) were uncertain about it. This finding is similar to a study done by Pooja and Delphinepriscilla Antony, where most of the general dental practitioners responded amalgam to be unsafe [14]. Half of the study participants (200,66.7%) were in favor of banning amalgam use in dentistry. most (220,73.3%) thought amalgam to be an occupational risk factor, only a small fraction (24,8%) didn't think so and 56 (18.7%) answered maybe. majority (239,79.7%)of them were bothered about the environmental issues of mercury.

Majority (286,95.3%) of the students are doing amalgam restorations in clinics and preclinics in VSPM Dental college and research centre as it is made compulsory by the curriculum. the no. of restoration done varied greatly, 88 (29.3%) did less than 5 restorations,78 (26%) did 5-10 restorations, 77 (25.7%) did 10-15 restorations and 57 (19%) did more than 15 restorations. majority (233,77.7%) of them don't use rubber dam and do not use any type of evacuation method (181,60.3%). Majority (205, 68.3%) of them disposed of amalgam contaminated gloves and cotton with other biomedical waste, 93 (31%) dispose in regular dustbin. majority (223,74.3%) do not use mercury spill kit.

This study has some limitations. The study was conducted in a single dental institution only and the sample was selected by convenience sampling method due to which the responses obtained cannot be generalized to the opinion of all the dental faculties, dental officers, interns and students.

V. Conclusion

From the present study we can conclude that the undergraduates have adequate knowledge about amalgam composition, controversy and its disposal methods. Most of them feel that the use of amalgam should be banned and discontinued due to environmental and health concerns due to mercury toxicity, yet it still remains controversial. Amalgam is practiced in pre clinics and clinics majorly for undergraduate dental education in VSPM dental college while proper safe practices of amalgam disposal and restoration are not practiced. However, it is clear from above study that better theoretical as well as clinical understanding of uses, practices and disposal of amalgam is required at undergraduate level.

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