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By Dr. Paul R., Dr. Dey N., Dr. Konar M., Dr. Bhattacharyya J., Dr. Das S. & Dr. Ghosh S.

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Complete Denture Impression Procedures and Techniques Practised by Dental Surgeons of a Dental College in Eastern Part of India: A Short Survey

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Keywords: survey, CD impression, disinfection, border molding, custom tray, sterilization.

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I. Introduction

Despite the increasing popularity of dental implants, complete denture (CD) prosthesis remains the most popular treatment modality for edentulous patients in socioeconomically weaker countries like India. Proper impression making is of utmost importance in the success of complete denture prosthesis. Several techniques for impression making following different school of thoughts including 'mucostatic,' 'muco-compressive,'' selective pressure,' 'functional technique' have been recommended in different standard textbooks of Prosthodontics by various authors.[1-5] Numerous studies have been conducted to find out the most suitable impression making procedure along with different modifications and refinements of protocols to enhance the final outcome. A large variety of impression materials from age-old Plaster of Paris to recently developed polyvinyl siloxane (PVS) and polyether (PE) have been advocated in search of ideal impression making of edentulous mouth. The choice of impression materials, impression tray, use of a spacer and its designing vary from clinician to clinician and so do their opinions regarding the final result.

A large number of surveys based on US and European countries regarding impression making for CD fabrication have been reported in various Dental journals by numerous researchers like Levin B and Sanders J L, Jaggers J H et al., Hyde T P et al., A l-Ahmar A O et al., Mehra M et al. etc. [1, 6-9] Probably due to lack of centralized documentation system very few surveys have been conducted across India on this issue and no comprehensive survey could be found in literature till date regarding the eastern part of India. [10-13] Therefore, the present survey aims to find out the current trends and their deviations from established procedures practiced by a group of dental surgeons attached with Guru Nanak Institute of Dental Sciences and Research, Kolkata, West Bengal, India.

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II. Methodology

A modified questionnaire based on previous surveys was distributed amongst 150 dental surgeons who are attached with Guru Nanak Institute of Dental Sciences and Research, Kolkata in West Bengal. [8, 9, 12-14] The questionnaire was tested and validated by the faculty members of the Department of Prosthodontics. The questionnaire was so designed that there was freedom of selecting multiple options to determine the current trend of clinical practice. The confidentiality of the respondents was maintained. The questionnaire contained 15 questions (Table 1) and where multiple answers were received, each one was counted. Percentage calculation was done out of total responses received for a particular question. The results were prepared by tabulating received data using Microsoft Excel software and analyzed. (Table 2)

Table 2: Results

Question No.	No. of Respondent	No Reply	Single Option	Only Option A [a]	Only Option B [b]	Only Option C [c]	Only Option D [d]	Multiple Options	Combination of multiple options
1	124	0	124	1 (0.8%)	123 (99.2%)			0	
2	124	0	102 (82.25%)	87 (70.2%)	15 (12.1%)	0	0	22 (17.74%)	a+b = 19, b+c=2 , a+b+c= 1
3	122	2	116 (95.1%)	111 (90.9%)	5 (4.1%)			6 (4.9%)	a+b= 6
4	123	1	123	33 (26.8%)	90 (73.2%)			0	
5	124	0	124	39 (31.45%)	85 (68.54%)	*Glutaraldehyde= 22, Disinfectant= 7, NaOCl= 4, Chlorohexidine= 3, Ethyl alcohol= 3* ***(Total= 39)***		0	
6	123	1	123	123	0			0	
7	123	1	121(98.37%)	117 (90.4%)	4 (3.25%)			2 (1.6%)	a+b=2
8	119	5	110 (92.43%)	109 (91.6%)	0	1 (0.84%)	0	9 (7.56%)	a+b= 4, a+c= 5
9	123	1	123	117(95.1%)	6 (4.8%)			0	
10	113	11	111 (98.23%)	75 (66.37%)	16 (14.15%)	17 (15%)	3 (2.65%)	2 (1.76%)	a+d=1, a+c=1
11	109	15	100 (91.74%)	52 (47.7%)	11 (10.1%)	15 (13.76%)	22 (20.2%)	9 (8.25%)	a+b= 2,a+c= 3, b+d= 2, a+d= 2
12	120	4	120	118 (98.34%)	2 (1.66%)			0	
13	119	5	112 (94.12%)	110 (92.43%)	2 (1.68%)	0	0	7 (5.88%)	a+b= 4, a+b+c= 2, a+c= 1
14	123	1	108(87.8%)	4 (3.25%)	91 (73.98%)	13 (10.57%)	0	15 (12.2%)	a+b=10, a+c= 2, b+c=1, a+b+d=2
15	123	1	123	36 (29.27%)	87 (70.73%)	*Glutaraldehyde= 21, Disinfectant= 7, NaOCl= 4, Chlorohexidine= 3, Ethyl alcohol= 1* ***(Total= 36)***		0	

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III. Results

A total number of 124 practitioners took part in this survey (out of 150), yielding a response rate of 82.7% (Table 2). Out of them, 26 specialists [6 (4%) endodontists, 9 (6%) orthodontists, 1 (0.7%) oral pathologist and 10 (6.7%) oral maxillofacial surgeons] did not participate in this survey.

123 (99.2%) respondents, who fabricated CD, reported that they made both primary and final impressions. Only one respondent believed that a single impression was enough for CD fabrication.

102 (82.25%) practitioners selected either impression compound or irreversible hydrocolloid as material for making the primary impression. Of them, 87 (70.2%) practitioners used only impression compound as the material of choice for primary impression while 15 (12.1%) respondents used irreversible hydrocolloid. 22 (17.74%) respondents used both impression compound and irreversible hydrocolloid as primary impression material according to the nature of the residual alveolar ridge. (Fig.: 1)

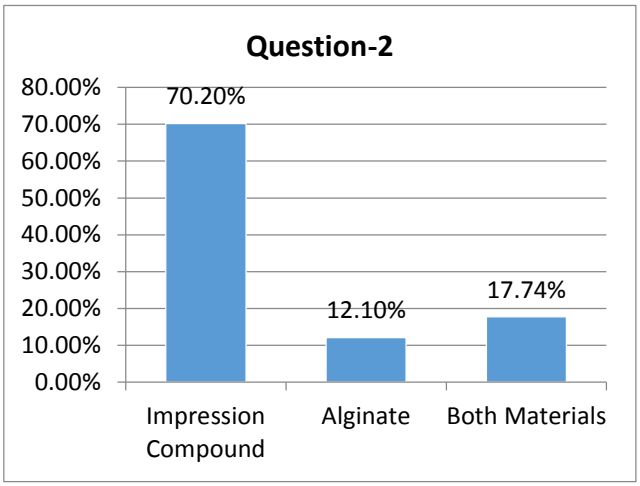


Figure 1: Percent distribution of responses regarding tray types preferred for making the primary impression.

For the primary impression, 111 (90.9%) respondents used only stock metal trays while 5 (4.1%) respondents preferred only plastic trays. Both metal and plastic stock trays were used by 6 (4.9%) respondents according to the condition of the alveolar ridge. (Fig.: 2)

Only 33 (26.8%) practitioners used modified stock trays whereas 90 (73.2%) respondents did not. Some of them, who use modified stock trays, were of varied opinion and commented as "if required," "not always," "depends on ridge condition" etc.

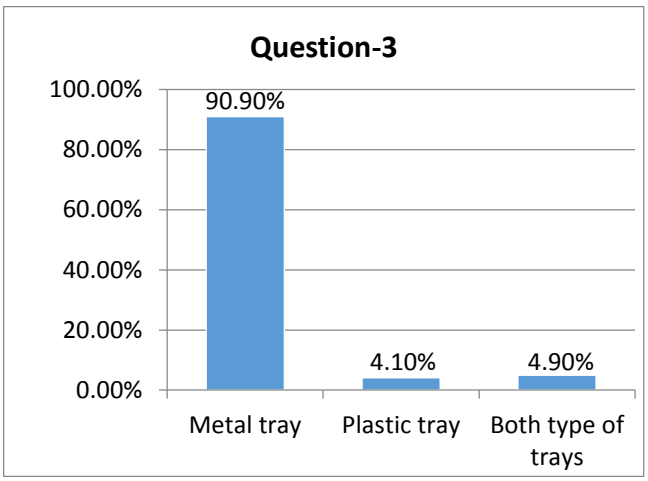


Figure 2: Percent distribution of responses regarding tray types preferred for making the primary impression.

For making a final impression, 117 (90.4%) respondents regularly used a custom tray, 4 (3.25%) respondents used modified primary impression as a special tray and only 2 (1.6%) clinicians followed both procedures. (Fig.: 3) Two practitioners added that they used "the previous denture as a custom tray" whenever it was feasible.

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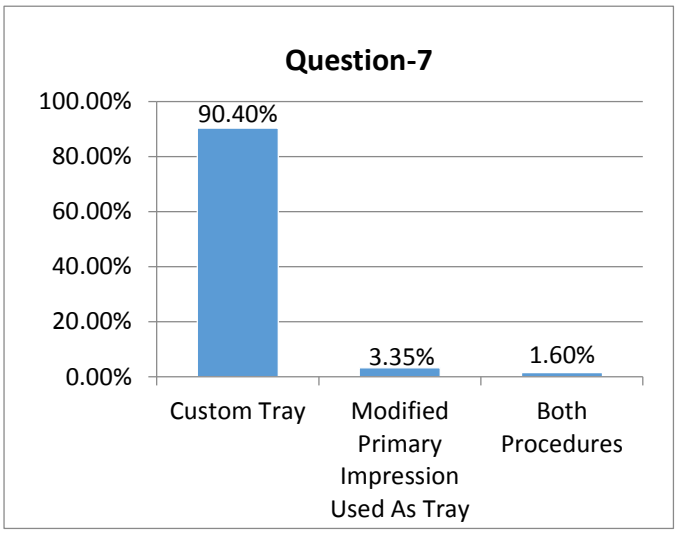


Figure 3: Percent distribution of responses regarding tray types preferred for making the final impression.

Larger part of the dental surgeons, i.e., 109 (91.6%) favoured self-cure acrylic resin for making a custom tray. Rest of the respondents 9 (7.5%) used multiple materials including self-cure acrylic resin, shellac base plate, and visible light cure (VLC) tray material. Only one respondent preferred the shellac base plate as tray material. (Fig.: 4)

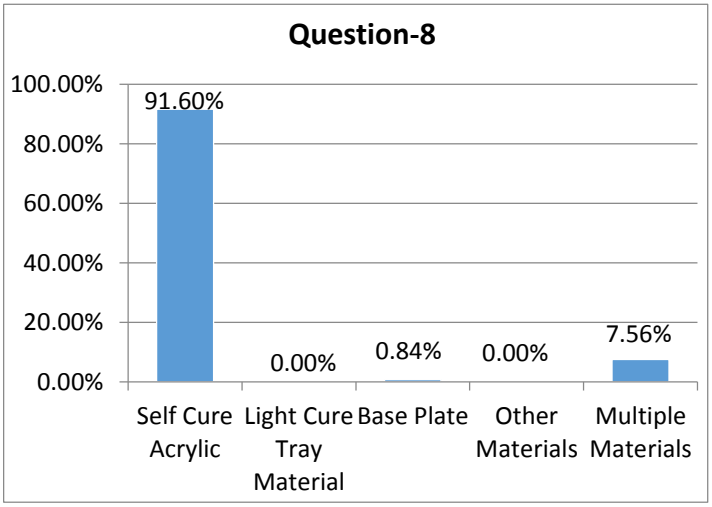


Figure 4: Percent distribution of responses for materials for making a custom tray.

117 (95.1%) practitioners used spacers on custom trays while only 6 (4.8%) respondents did not. Of them, 75 (66.37%) respondents used full spacers with tissue stops, followed by 16 (14.15%), who preferred full spacers except in major stress-bearing areas and PPS areas.17 (15%) employed spacers only on secondary stress bearing areas and relief areas. 3 (2.65%) respondents mentioned that they used spacers in special circumstances only. Out of 2 (1.76%) respondents who reported with multiple options; one respondent used both full spacer with tissue stops and spacers only in secondary stress areas and relief areas; while one respondent used a spacer in special circumstances along with the full spacer design with tissue stops. (Fig.: 5)

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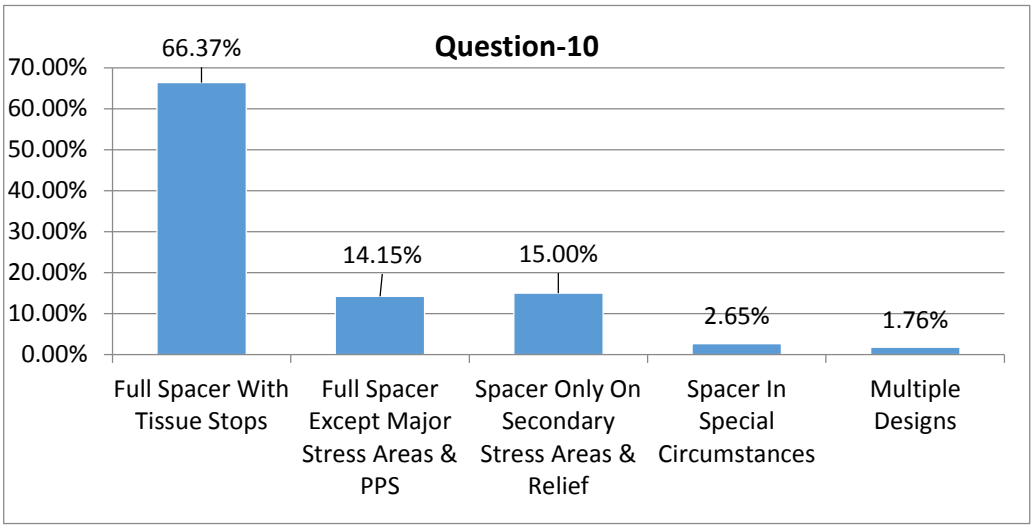


Figure 5: Percent distribution of responses for spacer design.

During final impression making of knife edge or flabby ridge, majority of respondents, i.e., 52 (47.7%) made relief holes in custom tray, 22 (20.2%) used a modified impression technique (composite impression techniques, window method, etc.), 15 (13.76%) applied spacer on the cast, and 11 (10.1%) performed a selective reduction of custom tray. 9 (8.25%) practitioners preferred combination of methods, like selective reduction of trays along with relief holes (2 respondents), extra spacers on the cast along with relief holes (3 respondents), both selective tray reduction and spacer on cast (2 respondents), and modified impression technique using tray with relief holes (2 respondents). (Fig.: 6)

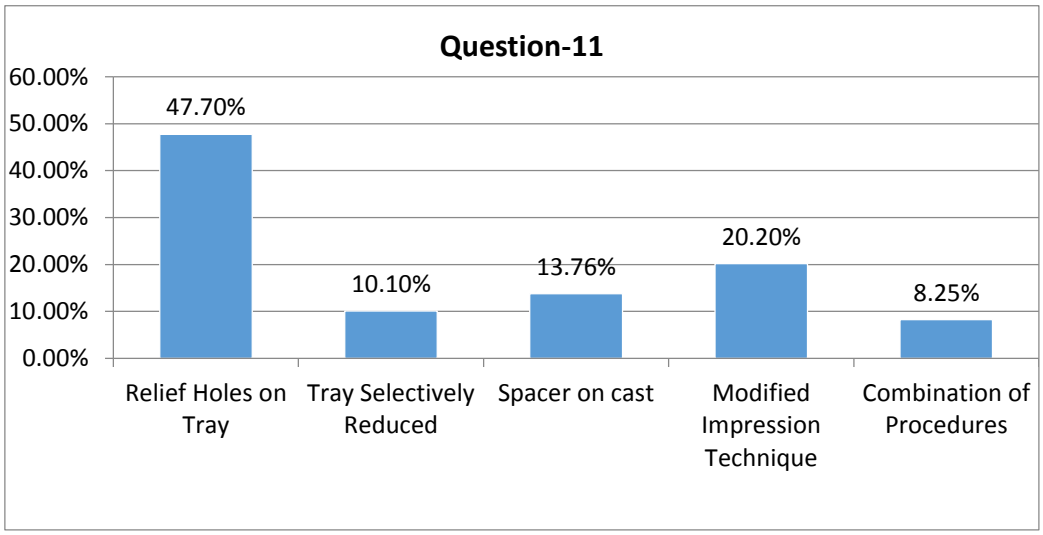


Figure 6: Percent distribution of responses for the type of relief used for knife edge alveolar ridge and flabby tissue.

118 (98.34%) respondents preferred border molding before making a final impression. Modeling plastic compound or green stick was the first choice as border molding material by 110 (92.43%) respondents followed by PVS by 2 (1.68%) respondents. 7 (5.88%) dental surgeons opted for multiple options, four of them preferred both green stick compound and PVS, while one respondent chose the green stick and PE. Only two respondents reported that they used all three border molding materials. (Fig.: 7)

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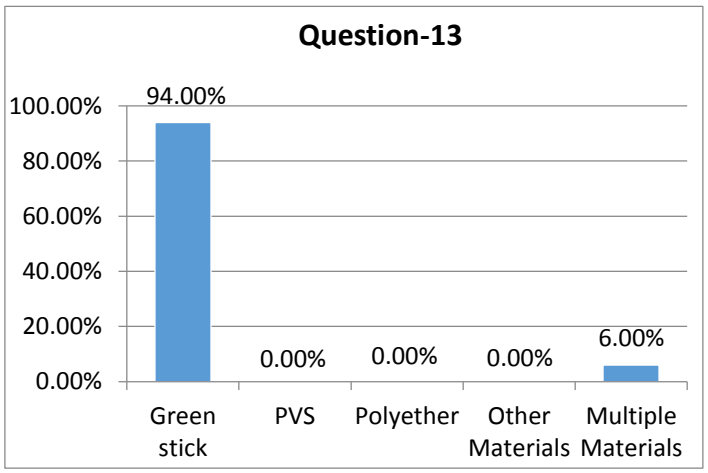


Figure 7: Percent distribution of responses for border molding material.

As the final impression material, Zinc Oxide Eugenol (ZnOE) was preferred by 91 (73.98%) respondents. Only 13 (10.57%) practitioners used irreversible hydrocolloid while 4 (3.25%) respondents used PVS. 15 (12.2%) respondents reported that they used multiple materials for final impression depending on ridge condition. (Fig.: 8) Among these 15 respondents, 9 of them selected both PVS and ZnOE, followed by PVS and alginate by two respondents. One respondent used alginate, and ZnOE while two of them were comfortable with PVS, ZnOE and PE. Some respondent made comments as, "PVS for maxillary and ZnOE for mandibular arch," "Light body for mandibular resorbed ridge," "medium body PVS" etc.

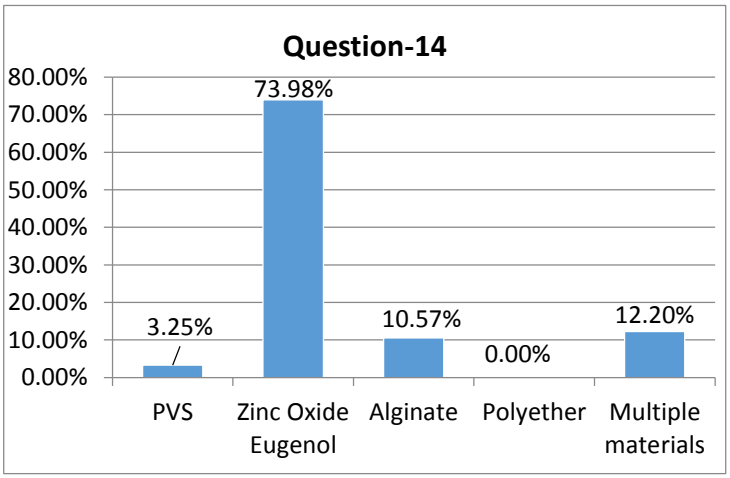


Figure 8: Percent distribution of responses for materials for making the final impression.

Regarding disinfection procedure of impression before sending to the laboratory, 39 (31.45%) practitioners disinfected primary impression whereas final impression disinfection was done by 36 (29.27%) only. Respondents who routinely did impression disinfection commonly used glutaraldehyde (56%-58%). Chlorohexidine and sodium hypochlorite were applied as a disinfectant by 11% and 8% practitioners respectively. Three respondents (7%) used ethyl alcohol to disinfect impressions. 19% of respondents could not mention the name of the disinfectant they used. (Fig.: 9, 10, 11 and 12)

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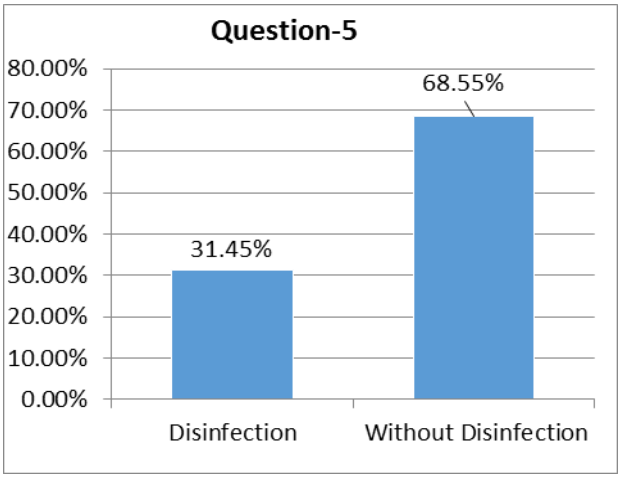


Figure 9: Percent distribution of responses for the disinfection procedure of the primary impression.

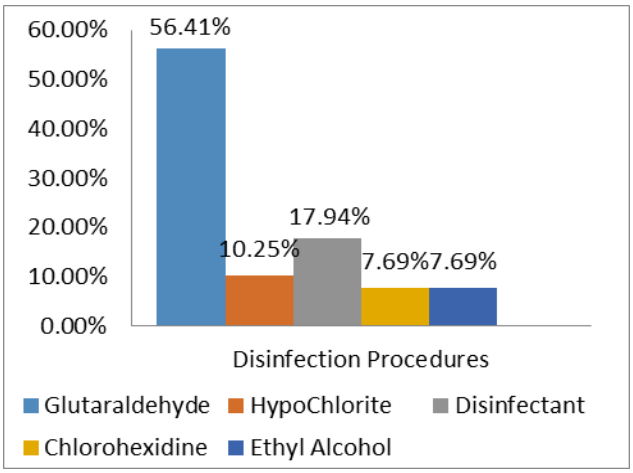


Figure 10: Percent distribution of responses for different disinfectants used to disinfect the primary impression.

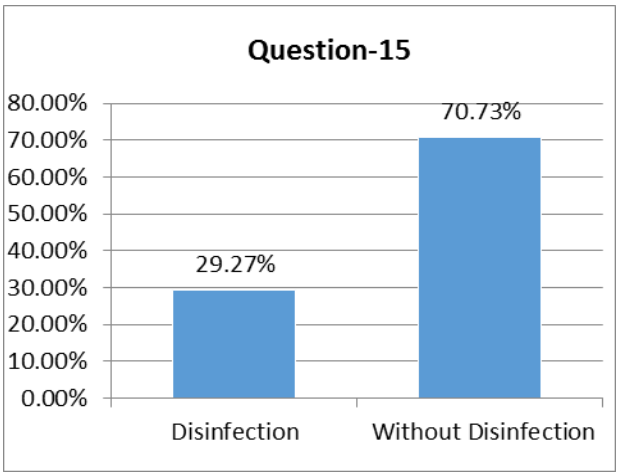


Figure 11: Percent distribution of responses for disinfection procedure of final impression.

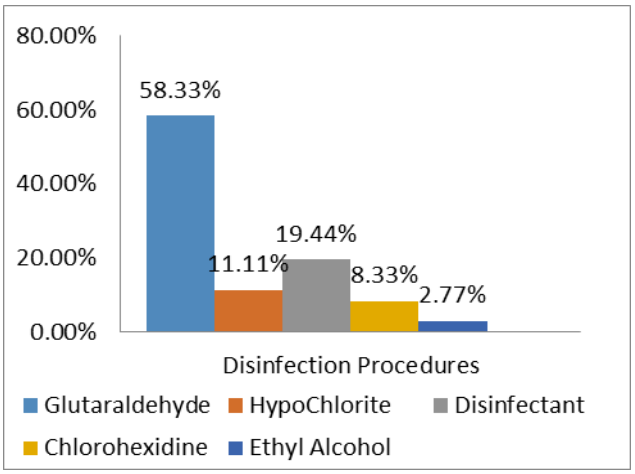


Figure 12: Percent distribution of responses for different disinfectants used to disinfect final impression.

IV. Discussion

The present survey did not direct the respondents to pick only one answer which made the interpretation of results more complex but enhanced the acceptability of the study to find out the directions of the current practice of CD fabrication.

This survey depicts that the majority of dental surgeons (99.2%) practicing CD fabrication preferred making both the primary and final impressions. This result is by the findings of previous surveys conducted in different parts of India, as well as surveys based on US and UK. [1, 6 - 13] Most standard textbooks of Prosthodontics recommend for both primary and final impression because primary impression is always overextended and fails to replicate minute surface details. On the contrary, a border molded secondary or final impression in custom tray replicates better border details, alleviates over-displacement of soft tissue and forms a proper peripheral seal.[3 - 5]

Impression compound is evident to be the material of choice for primary impression in this survey, though surveys across US and UK established irreversible hydrocolloid as the first preference for primary impression material for the last five decades. [8, 9, 15, 16] However, surveys across India show a mixed response. Two surveys in north India and Chennai established irreversible hydrocolloid as the best primary impression material (i.e., 100% and 71% respectively). [10, 13] The result of the present survey is supported by the result of surveys by Kakatkar VR et al. and Shah RJ et al. where they both found about 70% practitioners of western India prefer impression compound. [11, 12]

Majority of respondents (91%) of the present survey used metal stock trays which is contrary to the result of previous surveys. [12, 13, 16] A few practitioners (4%) reported using only plastic stock trays, but the problem may arise with poor fitting plastic trays as their wall flexure may produce inaccuracy.[17]

Guidelines from the British Society for the Study of Prosthetic Dentistry (BSSPD) recommended rigid trays for better accuracy. According to McCord and Grant, both metal and plastic rigid trays of appropriate

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extension can be used for making accurate primary impressions. [2, 17]

Regardless of the type of impression trays, oversized trays create tissue distortion, whereas undersize trays are unable to carry the impression material up to the proper extent of sulcus depth. So, a properly formed tray is mandatory to make a flawless impression. [9] Present survey reveals that only 27% practitioners regularly modify the impression trays which is in agreement with the finding of a recent survey of a post-doctoral program of dental schools in the US as well as in Gujrat.[12,18] Thermoplastic tray can be a better option because it is easily moldable, and subtractively adjusted to permit extension modifications as needed. [18, 19]

Most of the (90%) practitioners participating in this survey used a custom tray for final impression, and their material of choice (91.6%) was auto polymerizing acrylic resin. The surveys in other cities of India also yielded similar results. [11 - 13]One previous survey based on dental schools of US conducted in 1985 by Jaggers JH et al. showed that 98% preferred auto polymerizing acrylic resin for custom tray fabrication. A strikingly different scenario was found in a recent survey in 2014 by Mehra M et al. where VLC acrylic resin tray material was the material of choice for fabricating custom tray. [7, 9] Advantages of using VLC acrylic resin tray material are complete polymerization without residual monomer, better accuracy of fit, superior physical and handling properties than auto polymerizing acrylic resin. [14]

The present study elicited varied responses about spacer design which is very similar to a previous Indian survey. [12]Majority of respondents (66.37%) favored full spacers and tissue stops which is recommended by J.J. Sharry as well as by Morrow, Rudd, and Rhoads. 15% of respondents used Bernard Levin's design (i.e., spacer only in secondary stress areas) whereas 14% preferred full spacer except major stress-bearing areas and PPS areas, i.e., Boucher's design. [12, 18, 20] Ultimately all spacer designs of present survey attempt to follow Boucher's selective pressure technique of impression making. 9% of respondents did not reply, which exhibits that they had no personal preference and depended on laboratory technicians.

Present survey showed the majority of practitioners (47.7%) used relief holes on the tray and 20.2% practitioners used modified impression technique to encounter special clinical condition like a flabby ridge, knife-edge ridge or unemployed ridges which is harmonious with the result of previous studies. On the other hand, a US-based study revealed that modified impression technique with placing a window in the custom tray (46%) is more popular than placing relief holes (26%). [9, 12] These differences of opinion may be due to the reason that the modified impression technique is more time consuming, technique sensitive and needs proper clinical training and expertise. The aim of all the procedures is to record the hyperplastic tissue in undistorted position while to obtain support from the healthy tissue. [3] Another noticeable fact that a large number (12%) of respondents skipped this question which implies a lack of confidence in managing these clinical conditions.

Majority of the participants (98.34%) of this survey followed the conventional method of border molding before making the final impression. Similar findings have been reported in surveys of other parts of India as well as in US and UK. [7, 9, 11- 13] Regarding border molding material most of the respondent (92.43%) preferred green stick compound due to its ability of sectional molding & corrections, low cost, long shelf life, and dimensional stability. This result is harmonious with the findings of the surveys conducted in India. [11-13] But scrutinizing previous surveys of the US and UK, it is evident that a changeover in the choice of border molding material took place from the 1980s to 2010s. [1, 7, 9, 16, 21] A survey in 1984 showed green stick was the first choice for 96%, but other surveys in 2005, 2008 and 2014 reveal that it descends to 67%, 69%, and 71% respectively. [1, 7, 9, 21] The use of elastomeric material for border molding significantly gained popularity day by day due to its advantages like; simultaneous molding of the full arch in single insertion, less time consuming and comfortable for patients. [9, 22, 23] A recent survey in cities of western India showed a greater percentage (17%) of practitioners using elastomeric materials compared to the present survey. [11]

The greater number of respondents (73.98%) taken part in this survey preferred ZnOE for making a final impression which is in agreement with the results of other surveys in India. [11-13]A remarkably different result appears when previous surveys of US and UK are compared. In the70s and 80s, ZnOE was the material of choice for final impression, but elastomeric impression materials mainly polysulfide rubber gradually gained popularity in late 80s and 90s. In the last two decades, PVS materials eliminated the older traditional materials and became the most popular final impression material among the practitioners of the US. [6, 7, 9, 16, 21, 24] The reasons behind this are ease of handling, elastic recovery from undercuts, good tear strength, adequate working and setting times, dimensional stability and availability of different consistency and newer generation "hydrophilic" PVS. [9, 17] Despite that, low cost, accurate surface details, low viscosity and dimensional stability of ZnOE still make it well accepted to Indian dental practitioners.

Majority of the practitioners (70%) do not routinely disinfect impressions before sending to the laboratory. Some of them only rinse the impressions under running tap water which is not sufficient to prevent

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cross contaminations. As a result, transmission of infectious diseases like Hepatitis-B, Hepatitis-C, HIV may become a real threat to all health care personnel. It is not an exception because several UK based surveys reveal similar results. [1, 8] Present survey also exhibits a lack of intelligibility concerning the selection of disinfectants and method of application. The reason behind this fact is 19% respondents using disinfectant failed to mention the compositions, method or even trade names. Practitioners mostly preferred 2% glutaraldehyde (58%) for both primary and final impressions which are only recommended for addition silicone, ZnOE. Impression compound, polyether, and alginate impression should be disinfected with (0.5%) hypochlorite solution or iodophor, but only 8% practitioner used hypochlorite. Some of them mentioned ethyl alcohol and chlorohexidine as disinfectants which are not recommended in standard guidelines. [25, 26, 27] Incomplete responses on disinfection procedure indicate that infection control should be mandatory and practitioners should be more aware and specific regarding the selection of compatible disinfectant according to impression material used, the method of application and period for complete disinfection.

Out of 124 respondents only 25 (20.1%) Prosthodontists included themselves in this survey. If the survey was conducted exclusively among Prosthodontists, probably it may elicit a different outcome.

V. Conclusion

It can be summarised that present survey has succeeded to unveil the current trends of impression making in daily private practice by a certain group of dental surgeons who are attached with Guru Nanak Institute of Dental Sciences and Research which reflects the trends followed by the practitioners of Kolkata, West Bengal, i.e., the eastern part of India. Present survey reveals that the majority of practitioners mostly followed the basic methods and protocols documented in standard Prosthodontics textbooks. Most varied responses are elicited regarding spacer designs and type of relief for special clinical conditions of the residual alveolar ridge.

Limitations of this survey include a short sample size and inability to judge the truthfulness of the self-reported answers of the respondents. These findings are impossible to correlate with the success of denture as any individual would generally not admit to failures in the process that he/she has chosen. A further survey with a larger sample size may be needed as it may change the results.

Within the limitations of the survey, it can be concluded that:

1. Majority of practitioners prefer making the primary impression in the stock metal tray using impression compound.
2. Full spacer with tissue stops is the spacer design preferred by the majority of respondents.
3. Most of the respondents made a final impression using custom trays fabricated of the auto polymerizing acrylic resin after border molding with modeling plastic compound.
4. Material of choice for final impression is ZnOE impression material.
5. A majority of dentists made relief holes in the custom tray as a special consideration for flabby or knife edge alveolar ridge.
6. Impression disinfection procedure is neglected by the majority of the clinicians.

Abbreviations

	Abbreviations	Full form
1	CD	Complete denture.
2	ZnOE	Zinc Oxide Eugenol.
3	PVS	Poly vinyl siloxane.
4	PE	Polyether.
5	VLC	Visible Light Cure

Declaration of respondents' consent

In the questionnaire the dental surgeon(s) taken part in this survey has/have given his/her/their consent for sharing his/her/their clinical information for publication in the journal. The dental surgeons understand that their names and initials will not be published and due efforts will be made to conceal their identity.

Conflict of interest

No conflicts of interest

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Table 1: Questionnaire of the survey

DEPARTMENT OF PROSTHODONTICS AND CROWN & BRIDGE
GURU NANAK INSTITUTE OF DENTAL SCIENCES AND RESEARCH,
PANIHATI, WEST BENGAL, KOLKATA-700114.

COMPLETE DENTURE IMPRESSION PROCEDURES AND TECHNIQUES PRACTICED BY DENTAL SURGEONS IN G.N.I.D.S.R.: A SURVEY

Name: Dr. …… **Serial No.:**……
Department: Prostho. / Perio. / Endo. / Pedo. / Ortho. / O.S. / O.P. **Date:** ……..
Designation: Faculty / Clinical tutor / PGT / Other…….
Contact Number: ……

Instruction and Declaration: *Please tick all responses regarding CD fabrication that you apply in your dental practice. More than one answer may be selected. Apart from the below mentioned options, additional remarks to be mentioned where felt necessary. All data collected will be kept strictly confidential and will not be identified by other practicing dentist in future publication and presentation. Thank you for your co-operation.*

1. What impression procedures are followed?
   - o Only primary impression.
   - o Both primary and final impression.

   Remarks: ……..
2. What material is used for making primary impression?
   - o Impression compound.
   - o Alginate.
   - o Silicone.
   - o Other material (please specify).

   Remarks: ……..
3. What type of stock tray is preferred?
   - o Metal tray.
   - o Plastic tray.

   Remarks: ……..
4. Are stock trays modified before taking primary impression?
   - o Yes.
   - o No.

   Remarks: ……..
5. Is disinfection of primary impression done before sending to laboratory?
   - o Yes.
   - o No.

   If "Yes", Type of disinfection procedure ……
6. Is custom tray used for making final impression?
   - o Yes
   - o No

   Remarks: ……..
7. Tray used for making final impression:-
   - o Special / Custom Tray
   - o Primary impression modified and used for making final impression.

   Remarks: ……..
8. What type of material is used in fabrication of special tray?
   - o Cold cure acrylic resin.
   - o Visible light cure tray material.
   - o Base plate.
   - o Other material (please specify).

   Remarks: ……..

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9. Whether spacer is used in custom tray?
   - o Yes.
   - o No.

   Remarks: ……..

10. Design of spacer used:-
    - o Full spacer with tissue stops.
    - o Full spacer except major stress bearing areas and PPS areas.
    - o Spacer covering only on secondary stress bearing areas and relief areas.
    - o Spacer in special circumstances only.

    Remarks: ……..

11. Type of relief mostly used for flabby or knife edge ridge:-
    - o Relief holes on tray.
    - o Tray selectively reduced.
    - o Spacer on cast.
    - o Modified impression technique.

    Remarks: ……..

12. Border moulding of custom tray is performed or not?
    - o Yes.
    - o No.

    Remarks: ……..

13. Which material is used for border moulding?
    - o Modeling plastic impression compound (Green stick).
    - o Poly vinyl siloxane.
    - o Polyether.
    - o Other material (please specify).

    Remarks: ……..

14. Which material is used for taking final impression?
    - o Poly vinyl siloxane.
    - o Zinc oxide eugenol/eugenol free impression paste
    - o Alginate
    - o Polyether
    - o Other material (please specify)

    Remarks: ……..

15. Is disinfection of final impression done before sending to laboratory?
    - o Yes.
    - o No.

    If “Yes”, Type of disinfection procedure ……

……

Signature

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