

# Knowledge, Attitude and Practice of Dental Health Care Professional Toward Biomedical Waste Management During COVID-19

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## ABSTRACT

**Background:** Dental practices produce large amounts of biomedical waste (BMW); improper disposal of which can cause harm to us and the environment. Amidst the corona virus disease-2019 (COVID-19) pandemic, the scenario had further worsened with piles of personal protective equipment (PPE) accumulating in the hospitals. It is important to carry out proper disposal of BMW in order to break the chain of infection. Hence, this study was carried out to assess knowledge, attitude, and practice of dental healthcare professionals about important aspects of BMW and its amended guidelines during COVID-19.

**Method:** A cross-sectional questionnaire study was carried out among a convenient sample of dental professionals in a tertiary care dental center which was also a sampling center for COVID-19. A total of 107 participants returned back the questionnaire which was sent through mail. The questionnaire was validated. The subjects were followed up telephonically.

**Results:** The knowledge, attitude, and practice scores for all subjects were  $2.01 \pm 3.306$ ,  $3.62 \pm 1.40$ , and  $3.81 \pm 1.22$ , respectively, and were found to be significant on ANOVA test. The difference in knowledge and attitude score and knowledge and practice score among subjects was found to be significant on Turkey HSD post hoc test. Among sociodemographic characters, the difference in knowledge score was significant between males and females and between graduate and postgraduate.

**Conclusion:** Although the knowledge score is less for all subjects, the attitude and practice scores suggest a positive response of study subjects toward BMW. It is, therefore, necessary to carry out periodic training of the healthcare professionals to reinforce the basic knowledge.

**Keywords:** Biomedical waste management, COVID-19, Medical waste disposal.

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## INTRODUCTION

Biomedical waste (BMW) is any waste produced during the diagnosis, treatment, or immunization of human or animal research activities pertaining thereto or in the production or testing of biological or in health camps.<sup>1</sup> The various methods of BMW disposal are prevent, reduce, reuse, recycle, recover, treat, and lastly dispose. Many studies show that despite India being among the first country to initiate measures for safe disposal of BMW, there is an urgent need to take action for strengthening the existing system capacity, increase the funding, and commitment toward safe disposal of BMW.<sup>1</sup>

Proper biomedical waste management (BMW) as per the rules and guidelines has been one of the neglected aspects of healthcare system for years, especially in developing countries such as India. Changes have been initiated by prescribing simplified categories (color coded) for segregation of different BMWs by Government of India (GoI), Ministry of Environment, Forest, and Climate Change in 2016. Thereafter, an amendment also came into force in 2018 in order to improve the compliance to the rules.<sup>2,3</sup> Still, proper segregation, handling, and disposal are a serious concern for healthcare facilities across India with an annual growth rate of 7% with a projected estimate up to 775.5 Tons/d by the year 2022.<sup>4</sup>

With the advent of Coronavirus Disease 2019 (COVID-19) pandemic, the situation has further worsened as is evidenced by the piles of personal protective equipment (PPE) being accumulated in the hospitals during initial days of pandemic. Despite various guidelines by WHO and Ministry of health and Family Welfare on rationale use of PPE, it has been seen that there is inadvertent and

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overzealous use of PPE owing to fear of infection.<sup>5,6</sup> This has led to generation of enormous amounts of BMW; thereby aggravating the problem of its proper disposal with limited resources.<sup>7,8</sup> Recently, India produces around 600 metric tons of biomedical waste daily, which is approximately 10% more wastes, due to this pandemic situation of COVID-19.<sup>9</sup> Many types of BMW include masks, gloves, coveralls, and other PPEs are generated during a pandemic. Improper segregation and collection of BMW can lead to contamination of general waste; thereby causing transmission of infection.<sup>10,11</sup> A set of guidelines on dealing with, treatment, and removal of waste produced during treatment, determination and isolation of COVID-19 patients were released by the Central Pollution Control

Board (CPCB), New Delhi, Government of India on March 18, 2020.<sup>12</sup> Basic infection control practices is the only way to contain this pandemic and prevent its spread among healthcare workers and public at large. Hence, safe handling and proper disposal of BMW become an integral and crucial part of this strategy to break the chain of transmission.

Therefore, the aim of the present study was to assess knowledge, attitude, and practice of dental healthcare professionals about important aspects of BMWM and its amended guidelines during COVID-19. To the best of our knowledge, this is the first of its kind study to be published in literature.

## MATERIAL AND METHOD

### Study Population and Sample Size

An institutional based cross-sectional study was carried out in a tertiary care Government Dental Hospital of New Delhi for a period of 3 months from August, 2020 to October, 2020. It was conducted among a convenient sample of all postgraduate students (2017, 2018, and 2019 Batch) and senior residents. A total of N = 107 participants who consented were included in the study. Ethical clearance was obtained from the ethical board of the institute. Informed consent obtained from the participants. Those students and senior residents who gave informed consent and submitted the responses within time were included in the study. Those who refuse to participate and did not respond were excluded.

### Survey Tool

A self-administered questionnaire was developed and duly validated. The questionnaire was developed through a review of available scientific literature and national BMWM guidelines.<sup>12</sup> The questionnaire consisted of four sections, i.e., sociodemographic, knowledge, attitude, and practice. The questionnaire had both closed and open-ended questions.

Sociodemographic details included participants' age, gender, education, and questions related to COVID-19. The knowledge-related 8 questions among which seven objectives and one subjective. Objective questions had multiple options; of which four questions had multiple choice answers. This section comprises questions regarding participants knowledge of BMWM and its latest guidelines as per COVID-19. The attitude questions were five which measured participant's general attitude toward BMWM. The practice section has four questions which measured participant's practice toward BMWM. The questionnaire was analyzed by the 10-healthcare professional for assessing the content validity and was found to be satisfactory and had kappa value of 0.8. Content validity was calculated by dividing the number of raters giving 3 or 4 score by the number of raters.<sup>13</sup> The questionnaire was also having face validity when asked from the health professionals.

The investigator approached the subjects via telephone and asked the mailing details. The consent form, study details, and Google link of the form were mailed to the participants. After 15 days, reminder call was given and 2nd reminder after another 15 days. The data was obtained using online tool from Google forms by sending the questionnaire URL to the participants e-mail.

Data were collected and stored in compliance with IRB standards and analyzed using the Statistical Package for the Social Sciences software version 22.0 (SPSS Inc., Chicago, IL, USA). The questions in knowledge section were expressed as proportion into two categories as correct and incorrect. Scoring was done for seven

objective questions where 1 mark was given for correct response and 0 for incorrect or no response. The factors in attitude and practice section were assessed using a 5-point Likert scale: strongly agree (SA = 5) to strongly disagree (SD = 1). For scoring, following marks were allotted: 1 for Strongly Disagree, 2 for Disagree, 3 for Neutral, 4 for Agree, and 5 for Strongly Disagree. The Mean scores were calculated for knowledge, attitude, and practice section and ANOVA, and Turkey HSD Post-Hoc test were used for analysis. The mean scores were also compared with the sociodemographic details using unpaired t-test. A multiple regression was run to predict BMW practices with gender, age, qualification, knowledge, and attitude.

## (QUESTIONNAIRE) POSITION

Knowledge, Attitude, and Practice Questionnaire for Biomedical Waste Management during COVID-19

### Sociodemographic Details

- Age
- Gender:
  - Male
  - Female
- Occupation
- Education:
  - Undergraduate
  - Postgraduate

### Practice and COVID Related

- Pass out year:
  - Bachelor of Dental Surgery (BDS)
  - Master of Dental Surgery (MDS)
- Year Since practicing
- Type of practice:
  - Academician
  - Clinician
  - Both
- Currently practicing?
  - Yes
  - No
- How COVID has affected your practice?
- Do you think you are well prepared for practice during the present scenario?
  - Yes
  - No
  - Not sure
- Are you triaging your patients for COVID?
  - Yes
  - No
- Have you been infected by COVID-19?
  - Yes
  - No
  - Unsure

### Knowledge-related Question

- The BMW guidelines were formulated by? (Multiple choice)
  - CPCB
  - DPCC
  - HICC
  - All of the above

- Which all BMW is disposed off in yellow bag? (Multiple choice)
  - Face shield
  - Goggles
  - Shoe cover
  - Head cap
  - Mask
  - Triple layer/ N95 mask
  - Plastic coverall
  - All of the above
  - Do not know
- Which all BMW is disposed off in red bag? (Multiple choice)
  - Face shield
  - Goggles
  - Shoe cover
  - Head cap
  - Mask
  - Triple layer/ N95 mask
  - Hazmat suit
  - All of the above
  - Do not know
- What is the duration for which sodium hypochlorite is kept over spill in COVID management?
  - 10–15 min
  - 30 min
  - 45 min
  - Do not know
- Which of the following sharps is disposed off in white box? (Multiple choice)
  - Metal
  - Glass
  - Plastic
  - None
- Which of the following sharps is disposed off in blue box? (Multiple choice)
  - Implant
  - Glass
  - Metal
  - Plastic
- Are there any changes in disposal method of BMW during COVID?
  - Yes
  - No
  - Do not know
- If yes, please mention few changes
- My patients expect me to practice BMW management:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
- The rules, regulations, and checks for BMW management are not strict for clinics:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
- BMW management is a cumbersome method:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree

### Practice-related Questions

- I place BMW hazard symbol over BMW collection bag before transportation:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
- I pretreat infectious waste before disposal:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
- In my clinic, BMW segregation is done at stage of generation:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
- I use double yellow and red bags for disposal during COVID:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
- On an average, how much BMW is generated by your clinic per day?
  - 2–5 kg
  - 5–10 kg
  - 10–15 kg
  - More than 15 kg
  - Do not know
- BMW is collected from your clinic at how many intervals?
  - Daily
  - Every alternate day
  - Twice in a week
  - Once in a week
  - Do not know

### Attitude-related Questions

- BMW management is very important during COVID:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
- Disposal of waste should be done properly:
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree

## RESULTS

### Sociodemographic and COVID Related

The age range of the participants was from 22–60 years of age. As, shown in Table 1, 77 (71.9%) female and 30 (28.1%) males were included in the study. Regarding their educational level, 68 (63.5%) were postgraduates and the remaining were graduates. 30.8% are clinicians, 22.4% are academicians, while rest are both clinician and academician. 57 (53.2%) were of the opinion that they are well prepared to practice during present scenario while 34 (31.9%) were not sure of the same. 84.1% participants were triaging their patients for COVID-19. Only 6.62% subjects have been infected by COVID-19 at the time of study while 80.3% did not have infection. With respect to question that says “How COVID-19 has affected the practice,” the response rate was 92% and various responses that were received were:

- Fewer patients or less patient inflow
- More protective equipment with increased expenditure
- Longer time spent on pre- and postprocedural disinfection

### KNOWLEDGE

The knowledge score for all subjects was  $2.01 \pm 3.306$  (Table 2). As per Table 6, knowledge score was higher in males ( $2.07 \pm 2.14$ ) compared to females ( $1.21 \pm 1.31$ ). Postgraduates ( $2.13 \pm 1.97$ ) scored more than the graduates ( $1.26 \pm 1.28$ ). On unpaired *t*-test, difference in knowledge score among males and females, and graduate and postgraduate was found to be significant. On Turkey HSD post hoc test, difference in knowledge and attitude score and knowledge and practice score among subjects was found to be significant.

**Table 1:** Distribution of demographic characters of study subjects

Age (years)	
20–35	97 (90.8%)
36–50	5 (4.6%)
More than 50	5 (4.6%)
Gender	
Male	30 (28.1%)
Female	77 (71.9%)
Educational qualification	
Postgraduate (MDS)	68 (63.5%)
Graduate (BDS)	39 (36.5%)
Type of practice	
Academician	30 (22.4%)
Clinician	33 (30.8%)
Both	44 (46.8%)
Well prepared to practice during the current scenario?	
Yes	57 (53.2%)
No	16 (14.9%)
Not sure	34 (31.9%)
Triaging patients for COVID-19?	
Yes	90 (84.1%)
No	17 (15.9%)
Infected by COVID-19?	
Yes	7 (6.62%)
No	86 (80.3%)
Not sure	14 (13.08%)

As per Table 3, 59 (55.14%) participants knew that there were changes in disposal of BMW during COVID-19. For the subjective question which stated, “What are these changes?,” only 15 subjects out of 59 were able to answer and responses were as follows:

- Use of double yellow and red bag for disposal
- Proper segregation
- Labeling of bags with COVID-19 waste
- Pretreatment or disinfection of waste before disposal

### Attitude

The attitude score for all subjects was  $3.62 \pm 1.40$  (Table 2) and was significant. The difference in knowledge and attitude score among study subjects was found to be significant whereas between attitude and practice score was not found to be significant on Turkey HSD post hoc test. Maximum attitude score ( $4.15 \pm 1.57$ ) was found for Question 2. For Question number 4 and 5, subject's score is toward disagree category with score of 2.26 and 2.68, respectively (Table 4). On Turkey HSD post hoc test, the difference in score was found to be significant between question 1 and 4, Question 2 and 4 and Question 3 and 4 (Table 4). As shown in Table 6, attitude score was higher in females ( $3.95 \pm 1.17$ ) compared to males ( $3.41 \pm 1.29$ ). On unpaired *t*-test, difference in attitude score among demographic characteristics was not found to be significant. 74 (69.1%) subjects agreed that disposal of waste should be done properly. The response rate was 95%.

### Practice

The practice score for all subjects was  $3.81 \pm 1.22$  (Table 2) and was significant. Maximum practice score ( $4.16 \pm 1.06$ ) was found for Question 3. For all the questions, score is  $>3$  as shown in Table 5. On Turkey HSD post-hoc test, the difference in score was found to be significant between questions 2 and 3, and Question 3 and 4 (Table 5). As shown in Table 6, practice score was higher in females ( $3.98 \pm 1.21$ ) compared to males ( $3.21 \pm 1.17$ ). On unpaired *t*-test, difference in attitude score was found to be significant only between males and females.

In practice category, it was asked as to how much waste is generated by clinics in a day; the various responses were 2–5 kg, 5–10 kg, 10–15 kg, and  $>15$  kg, given by 28 (26.1%), 14 (13.1%), 10 (9.3%), and 2 (1.8%) subjects, respectively. 49 (45.7%) subjects did not know how much waste is generated in their clinic per day. For the question, “BMW is collected from your clinic at how many intervals,” the various responses were daily, every alternate day, once weekly, and twice weekly given by 60 (56.1%), 17 (15.8%), 4 (3.7%), and 6 (5.6%) subjects, respectively. 20 (18.6%) subjects did not know.

### Regression Analysis

The coefficient,  $B_1$  for age is equal to  $-0.0006$  and for each 1-year increase in age, there is a decrease in BMW practices by 0.0006 which is statistically nonsignificant. The coefficient of attitude was 0.651 and was found to be significant, that is, that by increase in attitude there is increase in practices (Table 7). Knowledge also showed positive coefficient but it was not statistically significant. The coefficient of determination was 0.3197 and our independent variables explain 31.97% of the variability of our BMW practices. The ANOVA table shows that the independent variables statistically significantly predict the dependent variable,  $F(4, 102) = 13.451, p < .0005$  (i.e., the regression model is a good fit of the data) (Fig. 1).

**Table 2:** Distribution and comparison of mean knowledge, attitude, and practices among the study subjects

Variables	Knowledge	Attitude	Practices
Mean and SD	2.01	3.306	3.81
ANOVA	p = 0.0000, S		
Turkey HSD Post-hoc test	Knowledge vs attitude: 95% CI = 0.8696 to 2.3504, p = 0.0000, S Knowledge vs practices: 95% CI = 1.0596 to 2.5404, p = 0.0000, S Attitude vs Practices: 95% CI = -0.5504-0.9304, p = 0.8178, NS		

(S, significant; NS: not significant; SD, standard deviation)

**Table 3:** Participants knowledge-related response for BMWM during COVID-19 (n = 107)

S. No.	Knowledge Questions	Correct	Incorrect
1	The BMW guidelines were formulated by?	36 (33.64%)	71 (66.36%)
2	Which all BMW is disposed off in yellow bag?	40 (37.38%)	67 (62.62%)
3	Which all BMW is disposed off in red bag?	76 (71.02%)	31 (28.98%)
4	What is the duration for which sodium hypochlorite is kept over spill in COVID?	28 (26.16%)	79 (73.84%)
5	Which of the following sharps is disposed off in white box?	58 (54.2%)	49 (45.8%)
6	Which of the following sharps is disposed off in blue box?	64 (59.81%)	43 (40.19%)
7	Are there any changes in disposal method of BMW during COVID?	59 (55.14%)	48 (44.86%)

(BMWM, biomedical waste management; COVID, coronavirus disease)

**Table 4:** Distribution and comparison of mean values of attitude questions among the study subjects

S. No.	Attitude Questions	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)	Overall (Mean ± SD)
1	BMW management is very important during COVID	67 (62.6%)	19 (17.7%)	0	0	21 (19.6%)	3.9 ± 1.62
2	Disposal of waste should be done properly	74 (69.1%)	13 (12.1%)	0	0	20 (18.6%)	4.15 ± 1.57
3	My patients expect me to practice BMW management	44 (41.1%)	27 (25.2%)	19 (17.7%)	1	16 (14.9%)	3.78 ± 1.411
4	The rules, regulations and checks for BMW management are not strict for clinics	2 (1.8%)	19 (17.7%)	26 (24.2%)	27 (25.2%)	33 (30.8%)	2.26 ± 1.116
5	BMW management is a cumbersome method	1 (0.9%)	34 (31.7%)	32 (29.9%)	29 (27.1%)	10 (9.3%)	2.68 ± 1.01
	ANOVA	p = 0.0000, S					
	Turkey HSD Post-hoc Test	1 vs 2: p = 0.6123, NS; 1 vs 3: p = 0.9359, NS; 1 vs 4: Difference = -p = 0.0000, S; 2 vs 3: p = 0.2698, NS; 2 vs 4: p = 0.0000, S; 3 vs 4: p = 0.0000, S					

(BMW, biomedical waste; S, significant; NS, not significant;

## DISCUSSION

Approximately, 10–25% waste derived from healthcare facilities is considered to be hazardous and carries a higher potential for infection than any other type of waste. In response to the COVID-19 pandemic in India, CPCB, Ministry of Environment, Forest and Climate has published guidelines for the management of waste generated during treatment/diagnosis/quarantine of COVID-19 patients.<sup>2,4</sup>

Improper collection practices could lead to contamination of general municipal solid waste with the virus, which could pose a risk of transmission. Therefore, the safe handling and final disposal of

this waste are a vital element of an effective emergency response. Appropriate identification, collection, separation, storage, transportation, treatment, and disposal, as well as important associated aspects including disinfection, personnel protection, and training become part of effective management of biomedical and healthcare waste.<sup>5</sup> Therefore, the present study was aimed at determining the knowledge, attitude, and practice regarding BMWs and various amendments amongst dental healthcare professionals in a tertiary care dental hospital.

The study was conducted in a premier dental teaching hospital which was catering to dental patients even during the pandemic and was COVID-19 sampling center as well. Initially, the focus was

**Table 5:** Distribution and comparison of mean values of practice questions among the study subjects

S. No.	Practice Questions	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)	Overall (Mean $\pm$ SD)
1	I place BMW hazard symbol over BMW collection bag before transportation	52 (48.5%)	29 (27.1%)	13 (12.1%)	2 (1.8%)	11 (10.2%)	3.94 $\pm$ 1.26
2	I pre-treat infectious waste before disposal	25 (23.3%)	45 (42.1%)	19 (17.7%)	8 (7.4%)	10 (9.3%)	3.57 $\pm$ 1.23
3	In my clinic, BMW segregation is done at stage of generation	45 (42.1%)	42 (39.2%)	13 (12.1%)	2 (1.8%)	5 (4.6%)	4.16 $\pm$ 1.06
4	I use double yellow and red bags for disposal during COVID	42 (39.2%)	26 (24.2%)	20 (18.6%)	7 (6.5%)	12 (11.2%)	3.57 $\pm$ 1.33
	ANOVA	$p = 0.0011, S$					
	Turkey HSD post-hoc test	1 vs 2: $p = 0.1532, NS$ ; 1 vs 3: $p = 0.5943, NS$ ; 1 vs 4: $p = 0.1532, NS$ ; 2 vs 3: $p = 0.0047, S$ ; 2 vs 4: $p = 1.0000, NS$ ; 3 vs 4: $p = 0.0047, S$					

S- Significant, NS- Not significant

**Table 6:** Distribution and comparison of mean Knowledge, attitude and practice with demographic characters among the study subjects

Variables	Age		Gender		Education level	
	20–35 yrs <i>n</i> = 97	> 35 yrs <i>n</i> = 10	Male <i>n</i> = 30	Female <i>n</i> = 77	Post Graduates <i>n</i> = 68	Graduates <i>n</i> = 39
Knowledge	2.01 $\pm$ 2.42	1.28 $\pm$ 1.39	2.07 $\pm$ 2.14	1.21 $\pm$ 1.31	2.13 $\pm$ 1.97	1.26 $\pm$ 1.28
Unpaired t-test	$p = 0.2061, NS$		$p = 0.0131, S$		$p = 0.0150, S$	
Attitude	3.34 $\pm$ 1.37	3.65 $\pm$ 0.77	3.41 $\pm$ 1.29	3.95 $\pm$ 1.17	3.46 $\pm$ 1.25	3.33 $\pm$ 1.37
Unpaired t-test	$p = 0.4841, NS$		$p = 0.0396, NS$		$p = 0.6182, NS$	
Practices	3.83 $\pm$ 1.23	3.68 $\pm$ 1.19	3.21 $\pm$ 1.17	3.98 $\pm$ 1.21	4.02 $\pm$ 1.14	3.70 $\pm$ 1.26
Unpaired t-test	$p = 0.7135, NS$		$p = 0.0035, S$		$p = 0.1817, NS$	

(BMW, biomedical waste; COVID, coronavirus disease; S, significant; NS, not significant)

**Table 7:** Regression analysis with practice as constant

Predictor	Coefficient	Estimate	Standard Error	t-statistic	p-value
Constant	$\beta_0$	0.4255	0.8453	0.5034	0.6158
Age	$\beta_1$	-0.0006	0.0174	-0.0372	0.9704
Gender	$\beta_2$	0.4392	0.2697	1.6285	0.1065
Knowledge	$\beta_3$	0.8049	0.5692	1.414	0.1604
Attitude	$\beta_4$	0.651	0.0988	6.5907	0
Summary of Overall Fit					
R-Squared:			r <sup>2</sup> =r <sup>2</sup> =0.3453		
Adjusted R-Squared:			r <sup>2</sup> adj=radj <sup>2</sup> =0.3197		
Residual Standard Error:			1.1326 on 102 degrees of freedom.		
Overall FF-statistic:			13.451 on 4 and 102 degrees of freedom.		
Overall pp-value:			0		
Analysis of Variance Table					
Source	df	SS	MS	FF-statistic	pp-value
Regression	5	70.2563	14.0513	10.9496	0
Residual Error	101	129.6105	1.2833		
Total	106	199.8668	1.8855		

on the emergency services and gradually in a phased manner, the hospital opened its normal outpatient services over span of 2–3 months. The hospital had implemented biomedical waste management practices efficiently. Patients were examined only

after triaging them. Regular training of all persons involved was carried out at frequent intervals.

In the current study, very few respondents (7%) were infected and they participated only after they recovered. In this study, there

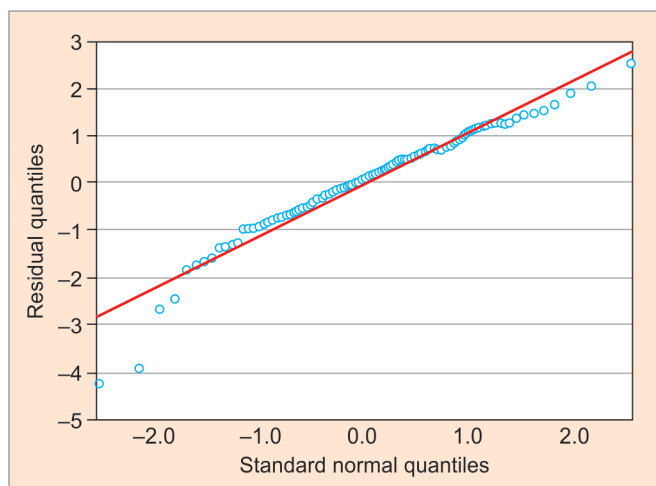


Fig. 1: Graph showing normal probability plot of residuals

were 77 (71.9%) females and 30 (28.1%) males. The knowledge score was low for all subjects while attitude and practice score showed that subjects agreed to the attitude and practice statements. There was difference in score between knowledge and attitude and between knowledge and practice. This might be because the subjects are following BMWM guidelines in their practice but they are not able to recall factual knowledge. Therefore, it is essential to reinforce the knowledge through periodic training and monitoring.

Regarding knowledge pertaining to disposal methods, majority participants were aware and gave the correct answer. 71.02% subjects had knowledge of red color coding and only 37.38% were aware of yellow color coding of BMW disposal. This is <92.3% from a study done by Karmakar et al.<sup>14</sup> but higher than study by Pandey et al.<sup>15</sup> where none of the subjects had knowledge of color coding. Incorrect knowledge of color segregation can result in improper disposal and thereby the treatment of waste; imposing harm to the environment. The mean knowledge score was higher in males compared to females. This could be due to the large discrepancy in sample size of males and females. The mean knowledge score was also higher among postgraduates compared to graduates. The plausible explanation for this could be because postgraduates were routinely sensitized to BMWM guidelines and were posted in COVID sampling area throughout.

With regards to the attitude of subjects toward BMWM, 69.1% participants agreed that disposal of waste should be done properly and mean score suggested agree response. Similarly, 62.6% subjects agreed that BMWM is important during COVID-19. There was favorable attitude response among study subjects as evident from the mean score. Similar to the present study, there was favorable response in study conducted by Karmakar et al.,<sup>14</sup> Samarakoon et al.,<sup>16</sup> and Deress et al.<sup>17</sup> Subjects disagreed to the statement that BMWM is a cumbersome method; thereby implying a favorable subject attitude. Females and postgraduates have a more positive attitude as compared to males and graduates, respectively. Overall, the attitude section had a favorable response among study subjects implying that the healthcare professionals are aware of the importance of proper BMWM and the hazards resulting from the improper disposal of the same.

The most crucial aspect of implementation of proper BMWM is the actual practice. With respect to practice questions, mean score suggest favorable practice response among all study subjects. This implies that subjects are following BMWM guidelines into their actual practice. Females and postgraduates have more positive

response as compared to males and graduates. 75.6% subjects practiced the use of biohazard symbol over bags. This is in contrast to the study by Kanchi et al.,<sup>18</sup> wherein 93% subjects were aware of biohazard symbol. 81.3% were aware that BMWM segregation is done at stage of generation. This is similar to the study by Karmakar et al.,<sup>14</sup> wherein 88.1% subjects agreed on source of segregation. 65.4% subjects in present study agreed that BMW is pretreated before disposal which is <74.6% response in study by Deress et al.<sup>17</sup>

This study results suggest a favorable attitude and practice response among healthcare professionals. Also, those who are into patient care and actual practice such as postgraduates showed a more positive response as compared to graduates who are merely observing. On comparing the results with other studies, it was seen that the subjects in developed countries have a more favorable knowledge, attitude, and practice score as compared to those in developing countries. This could be because of inadequate manpower, lack of strict enforcement guidelines, inefficient training, supervision, and reckless attitude of subjects toward BMW management in developing countries. Low knowledge score among study subjects imply need for more regular and thorough training programs through lecture and demonstration. Limitations of the present study include incorporation of only doctors in the study and not the paramedical and sanitation staff, which are also involved in handling of BMW.

It is crucial in the face of the fear and anxiety shown by the dental community toward COVID-19 that psychological coping mechanisms and strategies are practiced in order to remain calm and function efficiently.<sup>19</sup> The fear that dentists have regarding getting infected from COVID-19 could be greatly curtailed if dentists and dental healthcare workers meticulously follow the relevant recommendations issued by the regulatory authorities and follow the correct BMW management strategies which will benefit everybody. Therefore, it is necessary to carry out periodic training program for healthcare professionals and also to monitor the BMWM practices being followed at regular intervals.

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