

# Effectiveness of various health education methods amongst primary healthcare workers of western Uttar Pradesh, Delhi (National Capital Region), India: A promotive intervention study

Preeti Bhagia<sup>1</sup>, Ipseeta Menon<sup>1</sup>, Ricky Pal Singh<sup>2</sup>, Ritu Gupta<sup>1</sup>, Jyoti Goyal<sup>3</sup>, Dipshikha Das<sup>1</sup>

<sup>1</sup>Department of Public Health Dentistry, ITS - CDSR, Ghaziabad, Uttar Pradesh, <sup>3</sup>Research Department, National Institute of Tuberculosis and Respiratory Diseases, New Delhi, India, <sup>2</sup>Department of Land and Food Systems, University of British Columbia, Vancouver, Canada

## ABSTRACT

**Objectives:** The purpose of this study was to assess the effectiveness of various health education methods for improving oral health knowledge of accredited social health activists (ASHA) and *Anganwadi* workers of Muradnagar Block, Ghaziabad-Delhi NCR. **Methods:** A promotive interventional study was conducted amongst 301 ASHA and *Anganwadi* workers of Muradnagar block at three steps such as baseline, oral health education programme (OHEP), and reinforcement to assess their oral health knowledge using predesigned, close-ended, validated, questionnaire. Four different methods were used in OHEP to disseminate knowledge, namely, health talks, posters, and pamphlets, PowerPoint presentations, and a combination of all methods. Post-assessment was done one week after OHEP followed by reinforcement after 1 month which was followed by final post-assessment after 1 week. Students' independent *t*-test and one-way ANOVA were used for analysing data. **Results:** At baseline, primary healthcare workers had mean knowledge scores as  $14.67 \pm 1.152$  which was increased to  $20.96 \pm 1.053$  after the intervention and  $27.6 \pm 0.762$  after reinforcement. There was an increase of 7.6% and 14.3% of primary healthcare workers giving correct responses after OHEP and reinforcement, respectively. **Conclusions:** The combination method was the most effective in improving oral health knowledge of study population followed by posters and pamphlets and the least effective method was PowerPoint presentation. Dentists can play a vital role in mobilising the primary healthcare workers by consequently contributing towards improving the oral health status of the community.

**Keywords:** *Anganwadi*, ASHA, community health workers, education methods, health education, oral health

## Introduction

Systemic health, functional capacity, and social welfare are determined by an essential component of oral health.<sup>[1]</sup> There is a huge difference in oral health status between rural and urban areas in developing countries like India with disparities persisting in access to quality care.<sup>[2]</sup> As per previous studies, oral health

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**Address for correspondence:** Dr. Preeti Bhagia, Masters in Dental Sciences, Post Graduate, Department of Public Health Dentistry, I.T.S Center for Dental Studies and Research, Muradnagar, Ghaziabad - 201 206, Uttar Pradesh, India. E-mail: bhagia.preeti@yahoo.com

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knowledge is very poor amongst rural populations due to which India has a high incidence of dental decay and gum diseases.<sup>[3]</sup>

Health education must take into consideration five aspects of human nature, namely, prejudice; a creature of sentiment; a creature of habits; a creature of reason; and creature of refinement which brings together art and science of medicine, principles, and practices of general education. While disseminating knowledge it is important to keep principles of health education in mind to assure the effectiveness of knowledge such as<sup>[4]</sup> credibility, interest, comprehension, participation, motivation, learning by doing, known to unknown, setting an example, good human relations, feedback, community leaders, and soil, seed, the sower. There is a deficiency of dental healthcare professionals in providing oral health services in many areas wherein primary healthcare workers play a crucial role. It is easy for primary health workers to figure out problems being faced by people since they are elected from the same community.<sup>[5]</sup> Under various national health education programmes, they have successfully proved their efficient role in community education.<sup>[6]</sup>

The integrated child development services (ICDS) programme, pioneer programmes of Government of India, was launched on 2<sup>nd</sup> October 1975 in the welfare of National Policy for Children, 1974. Through *Anganwadi* centers (AWC's) services are delivered to beneficiaries which are managed by an *Anganwadi* worker and village helper. The word '*Anganwadi*' is developed from the Hindi word '*Angan*' meaning courtyard of the house. Children below 6 years, pregnant women, nursing mothers, and adolescent girls are the main target population to whom *Anganwadi* workers deliver services at community levels.<sup>[7]</sup> Accredited social health activists (ASHAs) are government instituted community health workers as part of the National Rural Health Mission (NRHM) appointed by India's Ministry of Health and Family Welfare.<sup>[8]</sup> ASHAs are local women activists trained to mobilise the community towards local health planning, increase utilisation and accountability of existing health services, and create awareness on health and its social determinants.<sup>[9]</sup>

Despite getting rigorous training on various health aspects, primary healthcare workers get the least oral healthcare training and are given the least priority in their training curriculum.<sup>[10]</sup> Appropriate, efficient, and optimum mode of communication for a specific audience is a major concern in health education.<sup>[11]</sup> In this backdrop, this study was initiated for making a comparative assessment of different methods of disseminating oral health knowledge amongst ASHA and *Anganwadi* workers.

## Methods

### Setting, population, and horizon

The study was conducted in Muradnagar Block (Delhi-National Capital Region) that has a population of around 3,42,057 as per 2012 census, comprising of 61 villages with 4 primary health centers (PHC), 1 community health center (CHC), 123 AWC's, 169 ASHA workers and 162 *Anganwadi* workers.

### Organisation of the survey

Approval of the study protocol was taken from the institutional ethical clearance committee. Permission was obtained from child development project officer, medical supervisor, and CHC authorities for conducting study along with informed written consents of all ASHA and *Anganwadi* workers.

### Study assessment proforma

A pilot study was carried out on 15 ASHA workers and 15 *Anganwadi* workers to check for operational feasibility before the main survey. A self-administered close-ended questionnaire was prepared by using a training manual for health workers and National Oral Healthcare Programme. The study proforma was divided into 2 parts, first part covering consent and sociodemographic variables while the second part consisting of 40 predesigned, close-ended, structured questions; 10 questions each in respect to basic oral health and hygiene, the oral health of pregnant and lactating women, and the oral health of children and common dental diseases. The questionnaire was translated into the local language (Hindi) and content validity was assessed by Cronbach's alpha test whose content validity index was 0.9. The translated question was checked for reliability by the test-retest method among 30 participants who completed the questionnaire twice with 2 weeks apart.

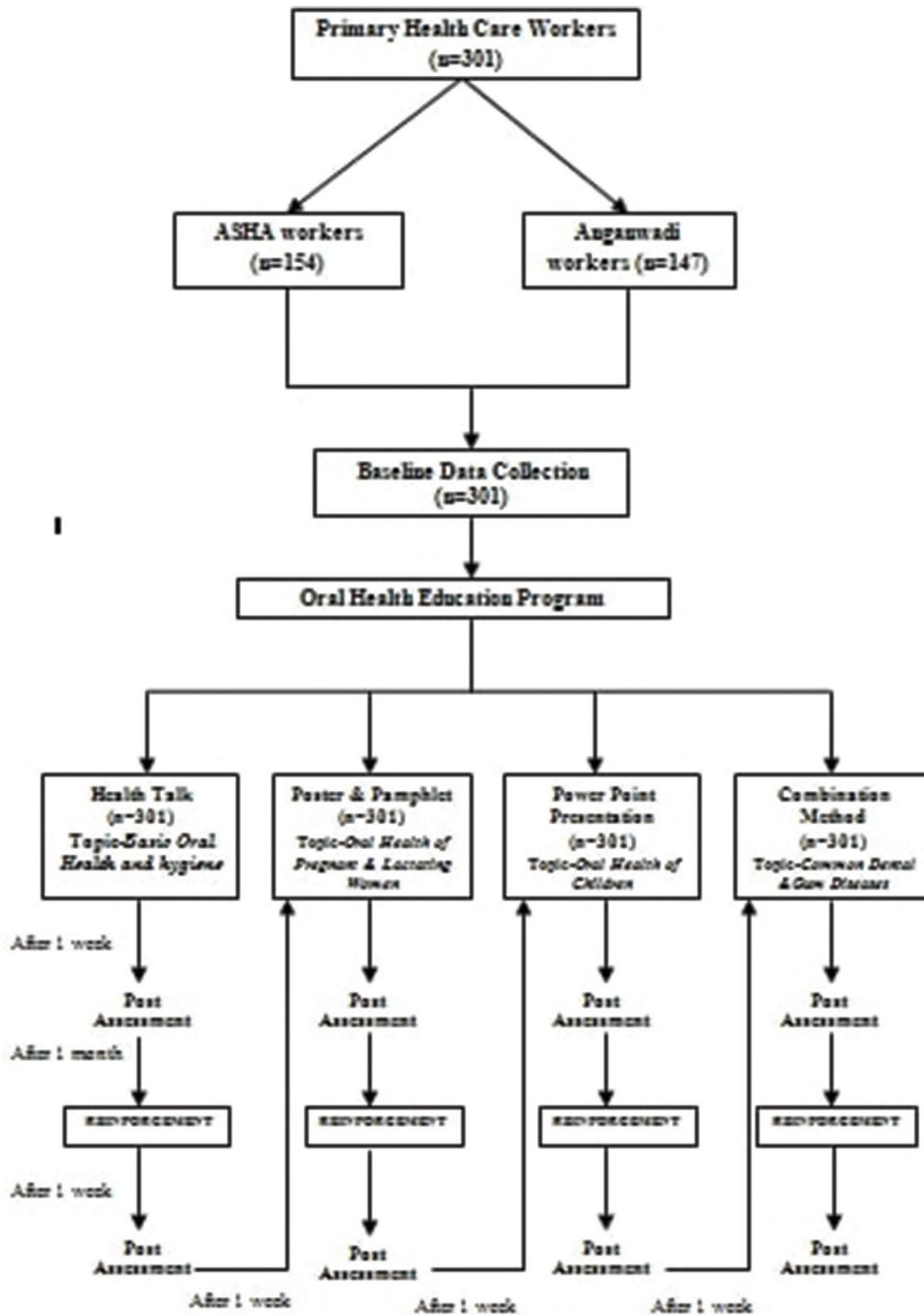
### Sample size

The sample size was 301 (154 ASHA workers and 147 *Anganwadi* workers) based on the total number of ASHA and *Anganwadi* workers working in Muradnagar block excluding who participated in a pilot study

### Study procedure [Figure 1]

Baseline data were collected by study proforma to test knowledge of ASHA and *Anganwadi* workers on oral healthcare. After baseline data collection oral health education programme (OHEP) was conducted by four different education methods each concerning four common dental topics. The first method was health talk using which knowledge was imparted on basic oral health and hygiene, the second method was posters and pamphlets that were used to impart knowledge on oral health for pregnant and lactating women, the third method was PowerPoint presentation used to disseminate knowledge on oral healthcare for children, and lastly, a combination of all three methods was used to educate about common dental and gum diseases. The study population was assessed based on proforma before and after the intervention. The proforma had multiple-choice questions with 3 to 4 options out of which one was correct, score 1 was given for correct answer and 0 for incorrect answer. Mean knowledge scores were divided into three categories: poor (0–15), fair (16–30), good (31–40) which were analysed at all three steps: baseline, post-intervention and after reinforcement.

The first post-assessment was done 1 week after every education method using the same proforma as used in the baseline. One month after the post-assessment reinforcement of knowledge



**Figure 1:** Study Procedure at Baseline, Oral health education program intervention and reinforcement

was done on a similar topic and similar educating method as in baseline followed by final post-assessment which was done 1 week after reinforcement. Distribution and collection of questionnaires and coding of the study population were done by an intern to blind.

### Oral health education programme

Education was imparted to the same study population by four different teaching methods on the respective four different topics to assess the effectiveness of the method. In method one, a 1-h health talk was given focusing on oral healthcare and

hygiene practices, functions of teeth, primary and permanent dentition, dietary habits, and brushing techniques. In method two, information regarding the oral health of pregnant and lactating women was imparted by pictorial representation with help of pamphlets, posters, and drawings on blackboard focusing on dental problems and its prevention, the influence of oral health on general health, impact of mother's oral health on an infant and breastfeeding practices. In method three, the 1-h presentation was shown on the oral health of children focusing on the importance of a tooth-friendly diet, injurious oral habits, malocclusion, bottle feeding, nursing bottle caries, early childhood caries, and best

oral healthcare practices. In method four, a combination of all three methods was used to impart knowledge focusing on dental caries, trauma, tobacco, periodontal problems, and oral cancer.

**Statistical analysis**

Data and responses of the study population were entered into an excel sheet and then subjected to analysis using SPSS software version 18. The description and comparison of data were done using students *t*-test and one-way ANOVA test followed by *post hoc* analysis.

**Results**

**Sociodemographic analysis [Table 1]**

The mean age of ASHA workers was 34.3 ± 8.7 and *Anganwadi* workers was 39.2 ± 7.2. The age group of 20–35 years had 34.4% of ASHA workers, 47.4% belonged to the age group of 36–50 years, and 18.2% to the age group of 51–65 years. Similarly, 21.8% of *Anganwadi* workers belonged to the age group of 20–35 years, 44.9% to the age group of 36–50 years, and 33.3% to the age group of 51–65 years.

ASHA workers with primary school education were 7.8%, 14.9% had middle school education, 39.6% had a high school certificate, 31.8% were intermediate pass, and 5.8% were graduates. Similarly, 12.2% of *Anganwadi* workers had just primary school education, 9.5% had middle school education, 43.5% had a high school certificate, 32% intermediate pass, and 2.7% were graduates.

ASHA workers of the lower socioeconomic class were 10%, 27.1% belonged to upper-lower socioeconomic class, 58.6% to

lower-middle socioeconomic class, and 4.2% to upper-middle socioeconomic class. Similarly, 7.8% of *Anganwadi* workers belonged to the lower socioeconomic class, 28.6% to upper-lower socioeconomic class, 60.2% to lower-middle socioeconomic class, and 3.4% to upper-middle socioeconomic class.

ASHA workers with experience of 0–5 years were 10%, 75.9% had the experience of 6–10 years, 14.9% had the experience of 11–15 years, and none of them had the experience of more than 16 years. Similarly, 7.5% of *Anganwadi* workers had the experience of 0–5 years, 40.1% had the experience of 6–10 years, 29.2% had an experience of 11–15 years, and 23.1% had the experience of more than 16 years.

**Correct responses analysis [Table 2]**

After OHEP and reinforcement, maximum correct responses amongst ASHA workers were seen in the combination method where an increase of 18% and 38.7% was seen after intervention and reinforcement respectively. Secondly, correct responses were seen in poster and pamphlet intervention where an increase of 15.3% and 24.5% was seen after intervention and reinforcement, respectively followed by health talk intervention where an increase of 12.6% and 19% was seen after intervention and reinforcement, respectively. Minimum correct responses were seen in PowerPoint presentation where an increase of only 11.7% and 17.1% was seen after intervention and reinforcement, respectively.

Similarly, amongst *Anganwadi* worker’s maximum, correct responses were seen in combination method intervention where an increase of 21.1% and 46.7% was seen after intervention and reinforcement, respectively. Secondly, correct responses were seen in poster and pamphlet intervention where an increase of 16.4% and 32% was seen after intervention and reinforcement respectively followed by health talk intervention where an increase of 9.4% and 31% was seen after intervention and reinforcement, respectively. Minimum correct responses were seen in PowerPoint presentation where an increase of only 8.7% and 20.4% was seen after intervention and reinforcement, respectively.

**Mean knowledge score analysis [Table 3]**

The mean difference in knowledge scores of all four methods is compared at post-intervention and reinforcement from baseline. On comparing knowledge scores from baseline using paired *t*-test, *P* value was < 0.001 which states that results were highly significant. Maximum improvement (2.058) in knowledge scores from baseline at post-intervention amongst ASHA workers has been seen in combination method and minimum improvement in knowledge scores (1.084) has been seen in PowerPoint presentation. However, amongst *Anganwadi* workers, maximum improvement (2.265) from baseline at post-intervention has been seen in health talk and minimum improvement in knowledge scores (0.878) has been seen in PowerPoint presentation.

Sociodemographic Variables	ASHA		<i>Anganwadi</i>	
	n	Percentage	n	Percentage
<b>Age</b>				
20 years-35 years	53	34.4	32	21.8
36 years-0 years	73	47.4	66	44.9
51 years-65 years	28	18.2	49	33.3
<b>Formal Education</b>				
Primary school	12	7.8	18	12.2
Middle school	23	14.9	14	9.5
High School	61	39.6	64	43.5
Intermediate School	49	31.8	47	32
Graduate	9	5.8	4	2.7
<b>Socioeconomic class</b>				
Lower	16	10.1	12	7.8
Upper Lower	42	27.1	42	28.6
Lower Middle	90	58.6	88	60.2
Upper Middle	6	4.2	5	3.4
<b>Level of Experience</b>				
0-5 years	14	9	11	7.5
6-10 years	117	75.9	59	40.1
11-15 years	23	14.9	43	29.2
More than 15 years	0	0	34	23.1

**Table 2: Percentage of ASHA and Anganwadi workers giving correct responses at baseline, post-intervention, and after reinforcement**

Sr.no	Questions	ASHA Workers			Anganwadi workers		
		Baseline n (%)	1 <sup>st</sup> Assessment after OHEP n (%)	2 <sup>nd</sup> Assessment after Reinforcement n (%)	Baseline n (%)	1 <sup>st</sup> Assessment after OHEP n (%)	2 <sup>nd</sup> Assessment after Reinforcement n (%)
Health Talk	1 During our lifetime how many set of teeth we have?	108 (70.1%)	145 (94.1%)	150 (97.4%)	90 (61.2%)	61 (41.6%)	60 (40.8%)
	2 Are three main parts of tooth enamel, dentin, pulp?	69 (44.8%)	130 (84.4%)	149 (96.8%)	70 (47.6%)	115 (78.2%)	130 (88.4%)
	3 What are Front teeth used for?	70 (45.5%)	129 (83.8%)	147 (95.5%)	56 (38.1%)	111 (75.5%)	127 (86.4%)
	4 What are back teeth used for?	60 (39%)	40 (26%)	11 (7.1%)	62 (42.2%)	39 (26.5%)	56 (38%)
	5 How many number of permanent teeth do we have?	70 (45.5%)	95 (61.7%)	126 (81.8%)	59 (40.1%)	102 (69.4%)	117 (79.6%)
	6 How should you clean your teeth?	47 (30.5%)	61 (39.6%)	92 (59.7%)	41 (28%)	54 (36.7%)	66 (44.9%)
	7 How often you should brush?	63 (41%)	71 (46.1%)	85 (55.2%)	28 (19%)	44 (29.9%)	68 (46.3%)
	8 Which of these is used as an interdental aid?	50 (32.5%)	53 (34.4%)	62 (40.3%)	22 (15%)	27 (18.4%)	85 (57.8%)
	9 Which is most important for good oral hygiene?	59 (38.3%)	61 (39.6%)	62 (40.3%)	18 (12.2%)	24 (16.3%)	106 (72.1%)
	10 How do you clean your teeth?	49 (31.9%)	54 (35.1%)	54 (35.1%)	28 (19%)	35 (23.6%)	113 (76.9%)
Posters and Pamphlets	11 Which oral disease is common in pregnant women?	87 (56.4%)	146 (94.8%)	144 (93.5%)	63 (42.9%)	94 (63.9%)	111 (75.5%)
	12 Pregnancy trimester safe for dental treatment?	70 (45.5%)	131 (85.1%)	147 (95.5%)	76 (51.7%)	82 (55.8%)	92 (62.5%)
	13 X rays harmful for mother and foetus in pregnancy?	77 (50%)	119 (77.2%)	137 (89%)	78 (53.1%)	93 (63.3%)	95 (64.6%)
	14 Malnutrition in pregnancy affect child's oral health?	76 (49.4%)	106 (68.8%)	126 (81.8%)	62 (42.2%)	39 (26.5%)	56 (38%)
	15 Poor gum health in a pregnant women may lead to?	70 (45.5%)	95 (61.7%)	126 (81.8%)	70 (47.6%)	78 (53.1%)	81 (55.1%)
	16 Which practice should pregnant female adopt?	75 (48.7%)	82 (53.2%)	96 (62.3%)	67 (45.6%)	78 (53.7%)	96 (65.3%)
	17 Pregnant and lactating women need which mineral?	78 (50.7%)	82 (53.2%)	88 (57.1%)	67 (45.6%)	82 (55.8%)	100 (68%)
	18 Smoking/Drinking in pregnancy harmful to child?	90 (58.4%)	92 (59.7%)	100 (64.9%)	53 (36.1%)	85 (57.8%)	106 (72.1%)
	19 Infant with no teeth is fed mouth should be cleaned?	92 (59.7%)	95 (61.7%)	110 (71.4%)	17 (11.6%)	74 (50.3%)	105 (71.4%)
	20 Is colostrum good for oral hygiene of the child?	12 (7.8%)	15 (9.7%)	30 (19.4%)	50 (3.4%)	93 (63.3%)	127 (86.4%)

*Contd...*



Table 2: Contd...

Sr.no	Questions	ASHA Workers			Anganwadi workers		
		Baseline n (%)	1 <sup>st</sup> Assessment after OHEP n (%)	2 <sup>nd</sup> Assessment after Reinforcement n (%)	Baseline n (%)	1 <sup>st</sup> Assessment after OHEP n (%)	2 <sup>nd</sup> Assessment after Reinforcement n (%)
Power Point	21 What time is correct to start cleaning baby's mouth?	81 (52.3%)	148 (96.1%)	154 (100%)	71 (48.3%)	81 (55.1%)	82 (55.8%)
	22 Decayed primary teeth affects permanent teeth?	57 (37%)	118 (76.6%)	154 (100%)	49 (33.3%)	55 (37.4%)	57 (38.8%)
	23 Sweetened milk before bed good for child's teeth?	60 (39%)	86 (55.8%)	136 (88.3%)	57 (38.8%)	57 (38.8%)	58 (39.5%)
	24 Should snacking items eaten in between the meals?	102 (66.2%)	95 (61.7%)	34 (22.1%)	97 (66%)	98 (66.7%)	100 (68%)
	25 Thumb sucking, lip biting can cause irregular teeth?	57 (37%)	58 (37.7%)	86 (55.8%)	56 (38.1%)	57 (38.8%)	68 (46.3%)
	26 How many milk teeth are there in a child?	34 (22%)	35 (22.7%)	44 (28.6%)	36 (24.5%)	41 (27.9%)	59 (40.1%)
	27 Is it important to take care of milk teeth?	76 (49.3%)	76 (49.3%)	77 (50%)	74 (50.3%)	92 (62.6%)	116 (78.9%)
	28 Immunisation protects children from Oral diseases?	51 (33.1%)	51 (33.1%)	51 (33.1%)	62 (42.2%)	86 (58.5%)	114 (77.6%)
	29 Food stuff that can cause tooth decay in children?	88 (57.1%)	89 (57.8%)	89 (57.8%)	73 (49.7%)	104 (70.7%)	136 (92.5%)
	30 You have a vital role to play in child's oral health?	3 (1.9%)	33 (21.4%)	47 (30.5%)	47 (32%)	79 (53.7%)	132 (89.8%)
	31 What does dental plaque mean?	56 (36.4%)	98 (63.6%)	154 (100%)	51 (34.7%)	63 (42.9%)	123 (83.7%)
	32 Frequent consumption of sweet during night lead to?	152 (50.6%)	87 (56.5%)	154 (100%)	74 (50.3%)	89 (60.5%)	119 (81%)
	33 What are the symptoms of gum diseases?	0	27 (17.5%)	92 (59.7%)	28 (19%)	65 (44.2%)	99 (67.3%)
	Combination Method	34 What causes mouth cancer?	145 (48.1%)	119 (77.3%)	137 (89%)	66 (44.9%)	93 (63.3%)
35 What are the symptoms of mouth cancer?		48 (31.2%)	81 (52.6%)	99 (64.3%)	38 (25.9%)	65 (44.2%)	132 (89.8%)
36 Bad Breadth can most effectively be prevented by?		41 (26.6%)	46 (29.9%)	70 (45.5%)	21 (14.3%)	74 (50.3%)	116 (78.9%)
37 High fluoride in drinking water supply can lead to?		75 (48.7%)	76 (49.3%)	90 (58.4%)	39 (26.5%)	72 (49%)	101 (68.7%)
38 Is there relation between diabetes and gum diseases?		36 (23.4%)	86 (55.8%)	108 (70.1%)	29 (19.7%)	67 (45.6%)	97 (66%)
39 Smoking causes which of the following?		99 (64.3%)	129 (83.8%)	138 (89.6%)	61 (41.5%)	75 (51%)	110 (74.8%)
40 Gingivitis if left unchecked can cause?		28 (18.2%)	63 (41%)	89 (57.8%)	33 (22.4%)	87 (59.2%)	112 (76.2%)

After reinforcement, the maximum improvement in knowledge scores from baseline was seen as 4.26 and 4.65 amongst ASHA and *Anganwadi* workers, respectively in combination method and least improvement was seen as 2.305 and 2.054 amongst ASHA and *Anganwadi* workers, respectively in PowerPoint presentation. On comparing knowledge scores of different educational methods using one-way ANOVA

test followed by *post hoc* analysis, it was seen that maximum improvement in knowledge scores at post-intervention and after reinforcement from baseline amongst study population was seen in combination method followed by posters and pamphlets, then health talk, lastly by PowerPoint presentation and results were found to be highly significant between all groups. ( $P < 0.001$ )

**Table 3: Comparison of mean knowledge scores of all four education methods at baseline, post-intervention, and reinforcement by paired *t*-test \*1<sup>st</sup> assessment- done 1 week after OHEP, \*\*2<sup>nd</sup> assessment- done one week after reinforcement**

		ASHA Workers				Anganwadi Workers			
		Mean Knowledge Score±Std. Deviation	Mean Difference	%change	<i>P</i>	Mean Knowledge Score±Std. Deviation	Mean Difference	%change	<i>P</i>
Health Talk	Baseline	4.1±1.248				2.63±0.974			
	*1 <sup>st</sup> Assessment	5.82±1.294	+1.721	41.9%	<0.001	4.89±1.283	+2.265	86.1%	<0.001
	Baseline	4.1±1.248				2.63±0.974			
	**2 <sup>nd</sup> Assessment	6.93±1.127	+2.825	68.9%	<0.001	6.41±0.792	+3.782	143.8%	<0.001
	*1 <sup>st</sup> Assessment	5.82±1.294				4.89±1.283			
	**2 <sup>nd</sup> Assessment	6.93±1.127	+1.104	18.9%	<0.001	6.41±0.792	+1.517	31%	<0.001
Posters and Pamphlets	Baseline	4.77±1.272				3.86±1.319			
	*1 <sup>st</sup> Assessment	6.2±1.265	+1.435	30%	<0.001	5.14±1.277	+1.286	33.3%	<0.001
	Baseline	4.77±1.272				3.86±1.319			
	**2 <sup>nd</sup> Assessment	7.72±0.763	+2.955	61.9%	<0.001	6.81±0.715	+2.952	76.5%	<0.001
	*1 <sup>st</sup> Assessment	6.2±1.265				5.14±1.277			
	**2 <sup>nd</sup> Assessment	7.72±0.763	+1.519	24.5%	<0.001	6.81±0.715	+1.667	32.4%	<0.001
PowerPoint Presentation	Baseline	3.53±1.03				4.22±1.461			
	*1 <sup>st</sup> Assessment	4.61±0.917	+1.084	30.7%	<0.001	5.10±0.956	+0.878	20.8%	<0.001
	Baseline	3.53±1.03				4.22±1.461			
	**2 <sup>nd</sup> Assessment	5.83±0.791	+2.305	65.3%	<0.001	6.28±0.680	+2.054	48.7%	<0.001
	*1 <sup>st</sup> Assessment	4.61±0.917				5.10±0.956			
	**2 <sup>nd</sup> Assessment	5.83±0.791	+1.221	26.5%	<0.001	6.28±0.680	+1.177	23.07%	<0.001
Combination Method	Baseline	3.8±0.999				2.50±0.917			
	*1 <sup>st</sup> Assessment	5.86±0.651	+2.058	54.1%	<0.001	4.30±0.780	+1.796	71.8%	<0.001
	Baseline	3.8±0.999				2.50±0.917			
	**2 <sup>nd</sup> Assessment	8.06±0.659	+4.261	112%	<0.001	7.16±0.570	+4.653	186.1%	<0.001
	*1 <sup>st</sup> Assessment	5.86±0.651				4.30±0.780			
	**2 <sup>nd</sup> Assessment	8.06±0.659	+2.201	37.6%	<0.001	7.16±0.570	+2.857	66.4%	<0.001

At baseline, 23.3% of primary healthcare workers had poor knowledge scores which were reduced to 0 after reinforcement. Similarly, 0.7% of primary healthcare workers had good knowledge scores at baseline which was increased to 32.2% after reinforcement.

### Comparison of knowledge scores with sociodemographic variables [Table 4]

Oral health knowledge was poor at baseline at with a nonsignificant difference (*P*-value = 0.011) among different age groups. There was an increase in knowledge scores at post-intervention (*P*-value = 0.131), and reinforcement (*P*-value = 0.313) with again no significant difference among different age groups thereby illustrating that

age of study population does not have an impact on their oral health knowledge.

Knowledge scores differed significantly among health workers at different educational levels (*P*-value = 0.032), primary healthcare workers with a higher level of education had higher mean knowledge scores as compared to primary healthcare workers with just primary education. However, after OHEP (*P*-value = 0.026) and reinforcement (*P*-value < 0001) difference in knowledge scores was still significant in respect to the level of education of primary healthcare workers thereby illustrating the educational level of the study population is directly proportional to their oral health knowledge.

**Table 4: Comparison of knowledge scores with sociodemographic variables using one-way ANOVA test**

Socio Demographic Variables	N	Knowledge Score at Baseline±SD	P	Knowledge Score at Post Intervention±SD	P	Knowledge Score at Post Intervention±SD	P
Age							
20 years-35 years	85	15.36±2.975	F=4.625	21.49±3.134	F=2.045	27.84±2.035	F=1.166
36 years-50 years	139	14.73±2.398	P=0.011	20.95±2.809	P=0.131	27.61±1.696	P=0.313
51 years-65 years	77	14.06±2.953		20.55±3.210		27.39±1.927	
Formal Education							
Primary School	30	14.6 ±3.136	F=0.878	20.10±3.857	F=1.715	27.47±1.889	F=1.600
Middle School	37	15.51±2.978	P=0.032	20.90±3.064	P=0.026	28.32±1.749	P<0.001
High School	125	16.61± 2.747		21.10±2.830		30.25±1.915	
Intermediate School	96	16.63± 2.609		22.60±3.038		29.47±1.789	
Graduate	13	17.92 ±2.139		21.31±1.653		30.69±1.843	
Socio Economic class							
Lower	28	14.64±2.927	F=0.878	20.57±2.963	F=1.232	27.33±1.729	F=1.338
Upper Lower	84	14.68±3.174	P=0.032	20.99±3.382	P=0.297	27.54±2.073	P=0.256
Lower Middle	178	14.87±2.605		21.09±2.927		27.97±1.732	
Upper Middle	11	14.54±2.330		20.94±2.684		27.51±1.720	
Level of Experience							
0-5 years	25	13.82 2.984	F=6.399	19.79 3.121	F=6.974	26.97 1.846	F=5.534
6-10 years	62	14.07 2.645	P<0.001	20.32 3.202	P=0.297	27.26 1.598	P=0.001
11-15 years	57	14.64 3.174		21.10 2.756		27.92 1.833	
More than 15 years	157	15.36 2.473		21.62 2.774		28.16 2.095	

The difference in knowledge scores at baseline, post-intervention and after reinforcement between different groups of socioeconomic status was insignificant ( $P = 0.664$ ,  $P = 0.297$ ,  $P = 0.256$ ) thereby illustrating that socioeconomic status of study population does not have an impact on their oral health knowledge.

Knowledge score at baseline, post-intervention and after reinforcement differed significantly among health personnel's different experience level ( $P$ -value  $< 0.001$ ), primary healthcare workers with higher experience level had higher scores as compared to primary healthcare workers with lesser experience. There was an increase in knowledge scores with an increase in experience level thereby illustrating that experience of the study population had a significant impact on their oral health knowledge.

## Discussion

Findings from this study whose aim was to assess the effectiveness of various health education methods for improving oral health knowledge of ASHA and *Anganwadi* Workers of Muradnagar Block, Ghaziabad were consistent with an improvement in mean knowledge scores after OHEP and reinforcement. These findings confirmed previous studies that reported and justified that primary healthcare workers could be used effectively as oral health guides after oral hygiene training package.<sup>[12-15]</sup>

In contrast to previous studies<sup>[15,16]</sup>, only 29.2% of the study population at baseline was aware of the well-proven fact that toothbrush and toothpaste is the best method to clean teeth. They had a firm belief that since ancient times nothing can work better than *neem* stick to keep teeth healthy. Maternal oral health

literacy on dental problems about pregnancy, proper nutrition, good oral health of the mother and safe radiation period are important factors to improve the chances of a healthy baby.<sup>[17,18]</sup> The study highlights major lacunae in baseline knowledge of the study population as they lack basic oral healthcare knowledge. Dental health education implementation at an early period of life is a key development period of life that needs to be prioritised to promote oral health.<sup>[19]</sup> Putting a child to bed with sweetened milk was believed to be okay for a child's teeth by 61% of the study population at baseline with likely findings reported by Basavaraj *et al.*<sup>[20]</sup> and Raj *et al.*<sup>[21]</sup> Despite the 21<sup>st</sup> century, our frontline healthcare workers are gripped in myths which might be an obstacle to provide appropriate oral healthcare to the community. Anti-tobacco education needs to be targeted at the community.<sup>[22]</sup> OHEP emphasised significantly on signs and symptoms of oral cancer so that these primary healthcare workers can be used for early detection of oral cancer and precancerous lesions as implied by Kangovi *et al.*<sup>[23]</sup>

The findings of this study were similar to studies conducted in past<sup>[24,25]</sup> which have stated that there is a significant difference in the impact of health education using different methods such as health talks, posters, pamphlets, flip charts, blackboard drawings, group discussions, and lecture. The specific audience needs specific and appropriate teaching methods to comprehend knowledge properly and consequently, every method has a different impact on knowledge score. As reported in previous studies<sup>[12,26,27]</sup> knowledge scores had a significant impact by the level of education and experience of study population whereas did not appear to be related to their age and socioeconomic status.

The study is based on the repetition and reinforcement learning model that is if the information is repeated at frequent and



definite time intervals then longer and sustainable knowledge output is expected. Consistent with previous studies,<sup>[28]</sup> mean knowledge scores and percentage of the study population giving correct responses improved significantly after reinforcement in comparison to post-intervention and baseline. On one hand, reinforcement has been shown to increase the likelihood that newly learned behavior will be repeated in the future in a study conducted by Green *et al.*<sup>[29]</sup> and on other hand repetition helps in reinforcing health education messages as seen in a study conducted by Gilbert *et al.*<sup>[30]</sup>

The main difference of this study with previous studies is that it reflects the effectiveness of OHEP at all three steps; baseline, post-intervention, and reinforcement which can be used for designing oral health education programmes in the future. The findings of this study should be interpreted considering some of its limitations. Firstly, education intervention was targeted only on ASHA and *Anganwadi* workers, so it was not a complete health promotion scenario, as no change in community, environment or lifestyle was advocated. Secondly, long-term assessment of improvements was not evaluated regularly and chances are improvement in knowledge of study population might have existed only during the programme for a shorter duration of time.

By empowering primary healthcare workers we may provide an effective, replicable mechanism of primary preventive oral healthcare to the community. However, for knowledge to be translated into positive sustained practice, concrete efforts, long-term orientation training, follow-up, and evaluation is necessary. Oral healthcare should be considered by the government to be included in the training curriculum of primary healthcare workers. These recommendations should focus on the main objective to assure their comprehensive implementation.

The study eventually revolves around the best training outcomes of primary healthcare professionals. Nationwide several training programmes for health workers are conducted periodically but still, healthcare workers lack substantial knowledge on major aspects of health especially oral health. The study creates strong relevance on the better practice of primary care by analysing the effectiveness of various health education methods for educating healthcare workers referred to as pillars of the system to create a model for adopting the best possible mediums to train them.

To conclude, every health education method reflected an improvement in oral health knowledge. The combination method was proven to be the most effective method, posters, and pamphlets as second best, health talk as third, and lastly PowerPoint presentation as the least effective method of education to ASHA and *Anganwadi* workers. PHC's form the first point of contact between the rural community and the healthcare system, thus primary healthcare workers can play a key role in areas where there is a deficiency of dental workforce in providing oral health education. The study emphasises educating health workers specifically on oral health and to make it resourceful it focuses on the adoption of the best possible method to inculcate that knowledge.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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