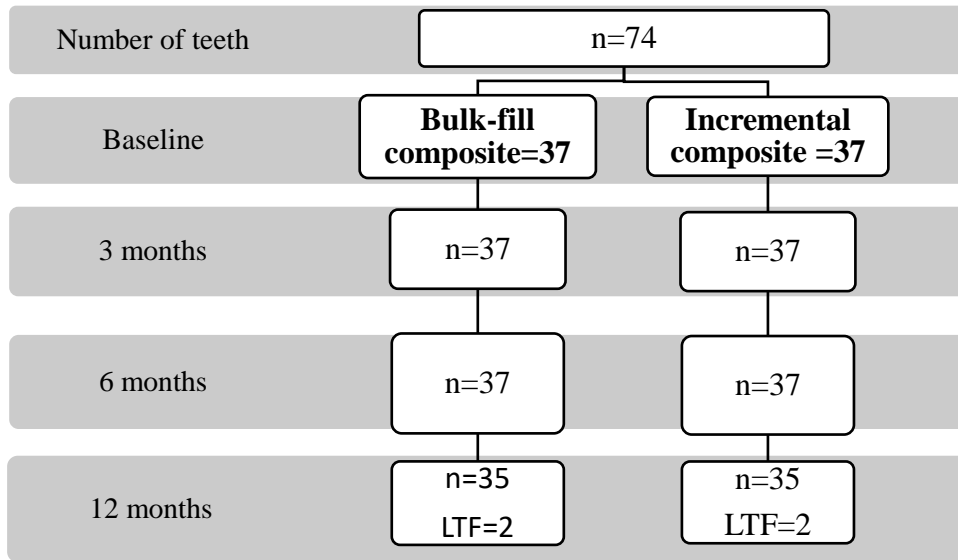


CLINICAL EVALUATION OF INCREMENTAL AND BULK-FILL COMPOSITE RESTORATIVE TECHNIQUES IN ENLARGED POSTERIOR OCCLUSAL AND PROXIMAL CARIOUS CAVITIES IN NIGERIAN ADULTS.

4.0 RESULTS

Twenty-six participants with 74 carious teeth were enrolled for the study. These teeth were randomized into two experimental groups and restored with either conventional incremental composite or bulk-fill composite (Figure 1).

The participant recall rate was 100% as at the 6-month review and dropped to 94% at the 12-month review, where 2 participants were lost to follow-up (Figure 1). All restorations were evaluated for fracture of material/retention, marginal adaptation, approximal anatomic form-contact point, post-operative hypersensitivity, and caries recurrence using the modified FDI criteria (Figure 1).



LTF=Lost to follow up

Figure 1: Flow chart showing number of recruited participants' teeth.

4.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

The majority (53.8%) of the participants belonged to the 21-30years age group, while the least (7.7%) were in the 50 years and above group. The mean age of the participants was 29.96 ± 11.1 years, with male: female ratio of 1:3.3. (Table 1).

Table 1: Socio-demographic characteristics of participants

Variable	Frequency (n=26)	Percentage (%)
Age group (Years)		
≤20	4	15.4

21-30	14	53.8
31-40	3	11.5
41-50	3	11.5
>50	2	7.7
Mean±SD	29.96±11.1	
Gender		
Male	6	23.1
Female	20	76.9

4.2 DISTRIBUTION OF THE PARTICIPANTS ACCORDING TO THE NUMBER OF PAIRS OF CAVITIES RESTORED IN THEIR MOUTHS

The majority (69.2%) of the participants had a single pair of enlarged cavities restored, followed by 19.2% who had 2 pairs of cavities restored, while 11.5% had 3 pairs of cavities restored. (Figure 2).

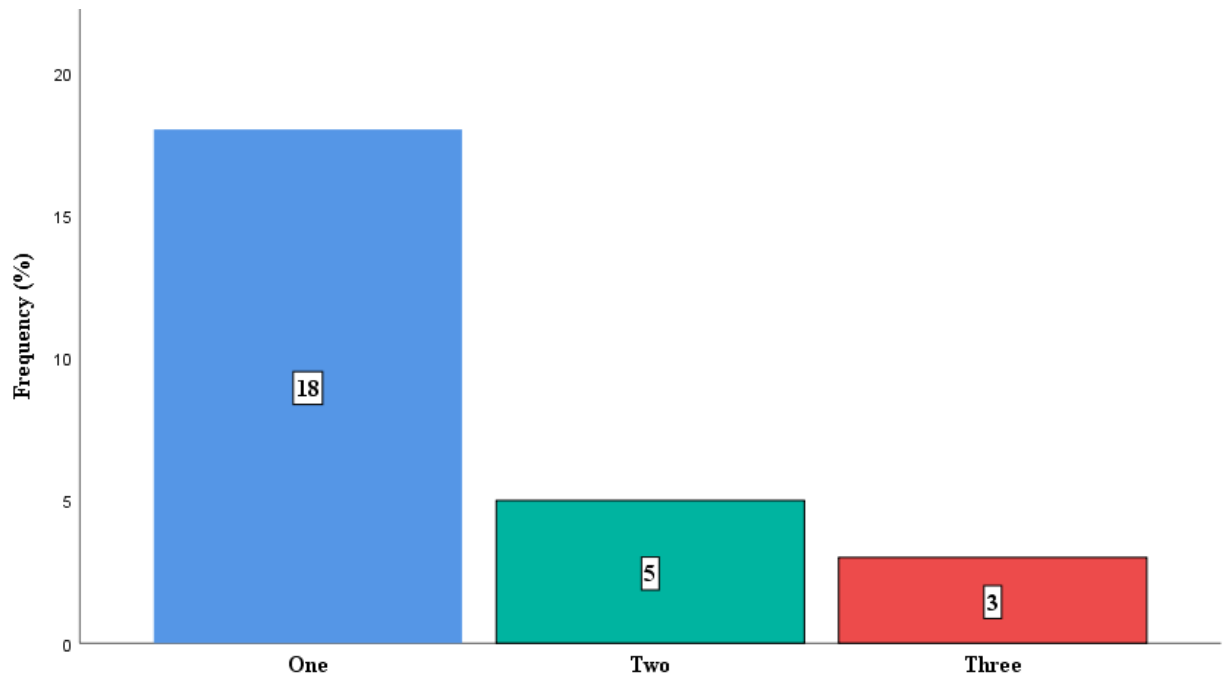
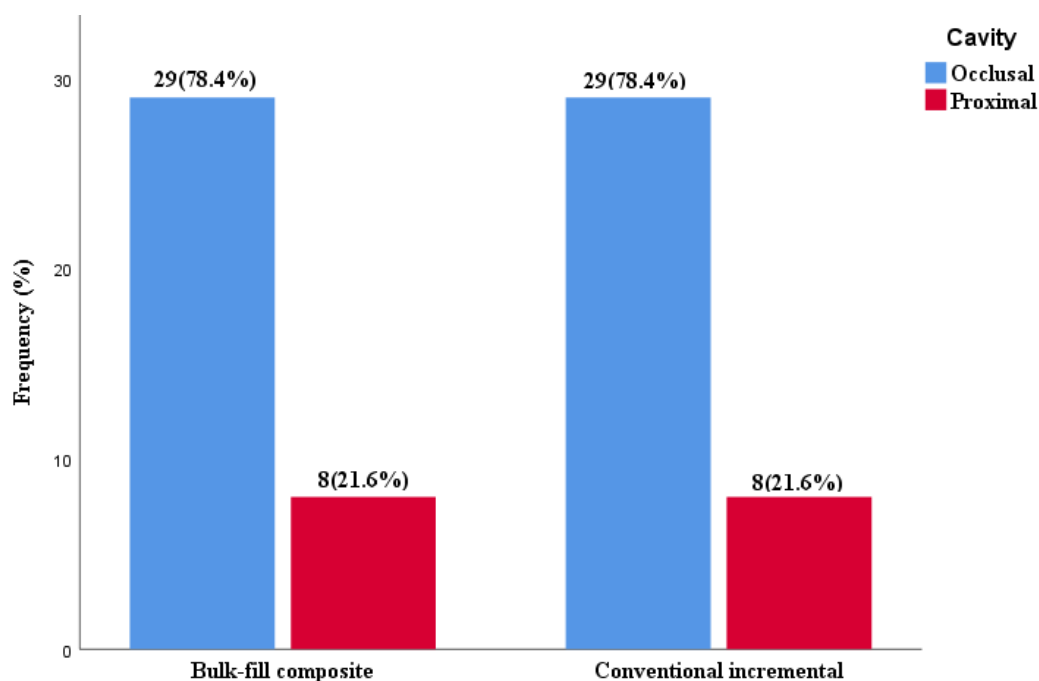


Figure 2: Distribution of the participants according to the number of pairs of cavities restored in their mouths

4.3 DISTRIBUTION OF THE TYPE OF CAVITY BY RESTORATIVE TECHNIQUE USED.

Occlusal and proximal cavity distributions were similar in the bulk-fill and conventional incremental composite technique groups, with both groups having 29 (78.4%) occlusal and 8 (21.6%) proximal cavities respectively (Figure 3).

0



$\chi^2=0.000$, $p=1.000$

Figure 3: Distribution of the type of cavity by restorative technique used.

4.4 DISTRIBUTION OF THE RESTORATIVE TECHNIQUES ACCORDING TO TOOTH TYPE, JAW, AND SIDE OF THE MOUTH.

In both the bulk-fill and the incremental composite restoration groups, most of the teeth restored were second molars, which was followed by the first molars, second premolars, and least of all, the first premolars. A slightly higher number of cavity restorations (51.4%) were done on maxillary teeth when compared to mandibular teeth, however equal numbers of teeth were restored with bulk-fill and incremental restorations in the maxillary and mandibular arches. A slightly increased

number of cavity restorations (58.1%) were done on the left side compared to the right, however more bulk-fill composite restorations were done on the right side and more incremental composite restorations were done on the left side. (Table 2).

There was no statistically significant difference between the dental-related characteristics in both groups ($p>0.05$)

Table 2: Distribution of the restorative techniques according to tooth type, jaw, and side of the mouth.

Characteristics	Composite restorative technique		Total	χ^2	p-value
	Bulk-fill (n=37)	Incremental (n=37)			
Teeth type					

First premolar	3(8.1)	3(8.1)	6(8.1)	1.515	0.679
Second premolar	4(10.8)	6(16.2)	10(13.5)		
First molar	8(21.6)	11(29.7)	19(25.7)		
Second molar	22(59.5)	17(45.9)	39(52.7)		
Jaw					
Maxilla	19(51.4)	19(51.4)	38(51.4)	0.000	1.000
Mandible	18(48.6)	18(48.6)	36(48.6)		
Side					
Right	16(43.2)	15(40.5)	31(41.9)	0.056	0.814
Left	21(56.8)	22(59.5)	43(58.1)		

4.5 EVALUATION OF FUNCTIONAL PROPERTIES OF INCREMENTAL AND BULK-FILL COMPOSITE RESTORATIONS IN ENLARGED OCCLUSAL AND PROXIMAL POSTERIOR CARIOUS CAVITIES

4.5.1 Fracture of material/ retention of incremental and bulk-fill composite restorations in enlarged occlusal and proximal posterior carious cavities.

4.5.1.1 Fracture of material/ retention of incremental composite restorations.

All the incremental composite restorations maintained the clinically excellent outcome (score 1) throughout the 12 months' review period (Table 3).

Table 3: Clinical scores for fracture of material/retention at various evaluation periods for incremental composite restorations.

Clinical score	Evaluation periods			
Clinical score	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	37(100.0)	37(100.0)	37(100.0)	35(100.0)
2	0(0.0)	0(0.0)	0(0.0)	0(0.0)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.5.1.2 Fracture of material/ retention of bulk-fill composite restorations

All the bulk-fill composite restorations maintained a clinically excellent outcome (score 1) for fracture of material/retention from baseline up to 6 months, however at 12 months, 5.7% of the bulk-fill composite restorations showed evidence of either fracture of the material or loss of retention and therefore had a drop in their clinical performance rating from clinically excellent to clinically good outcome (score 2) (Table 4).

Table 4: Clinical scores for fracture of material/retention at various evaluation periods for bulk-fill composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	37 (100.0)	37 (100.0)	37 (100.0)	33 (94.3)
2	0(0.0)	0(0.0)	0(0.0)	2(5.7)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.5.2 Marginal adaptation of incremental and bulk-fill composite restorations in enlarged occlusal and proximal posterior carious cavities.

4.5.2.1 Marginal adaptation of incremental composite restorations.

At baseline, 3-months and 6-months, the marginal adaptation of the incremental composite material was rated clinically excellent (score 1) for all the restorations, however at 12 months, 8.6% of the restorations showed evidence of slight ditching with minor irregularities, and

therefore had a drop in their clinical performance rating from clinically excellent to clinically good outcome (score 2) (Table 5).

Table 5: Clinical scores for marginal adaptation at various evaluation periods for incremental composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	37 (100.0)	37 (100.0)	37 (100.0)	32(91.4)
2	0(0.0)	0(0.0)	0(0.0)	3(8.6)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.5.2.2 Marginal adaptation of bulk-fill composite restorations

At baseline and 3-month reviews, the marginal adaptation of the composite material to the tooth surface was rated clinically excellent (Score 1) for all the bulk-fill composite restorations. At 6 months, 5.4% of the restorations dropped to a clinically good score, evidenced by slight ditching and minor irregularities (score 2), and at 12 months, 82.9% of the bulk-fill composite restorations still maintained the clinically excellent outcome (Score 1) while 17.1% had slight ditching or minor irregularities (score 2) (Table 6).

Table 6: Clinical scores for marginal adaptation at various evaluation periods for bulk-fill composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	37 (100.0)	37 (100.0)	35 (94.6)	29 (82.9)
2	0(0.0)	0(0.0)	2(5.4)	6 (17.1)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.5.3 Approximal anatomical form-contact point of incremental and bulk-fill composite restorations in enlarged occlusal and proximal posterior carious cavities.

4.5.3.1 Approximal anatomical form-contact point of incremental composite restorations.

Only eight teeth had proximal restorations, and the rest were occlusal restorations.

Throughout the 12-month evaluation, approximal anatomical form-contact point for all the incremental composite restorations had excellent clinical outcomes (Table 7).

Table 7: Clinical scores for approximal anatomical form-contact point at various evaluation periods for incremental composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	8 (100.0)	8 (100.0)	8 (100.0)	8 (100.0)
2	0(0.0)	0(0.0)	0(0.0)	0(0.0)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.5.3.2 Approximal anatomical form-contact point of bulk-fill composite restorations.

Only eight teeth had proximal restorations, and the rest were occlusal restorations.

The approximal anatomical form-contact point for all the bulk-fill composite restorations retained excellent clinical outcomes throughout the 12-month evaluation, (Table 8).

Table 8: Clinical scores for approximal anatomical form-contact point at various evaluation periods for bulk-fill composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	8 (100.0)	8 (100.0)	8 (100.0)	8 (100.0)
2	0(0.0)	0(0.0)	0(0.0)	0(0.0)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.6 EVALUATION OF BIOLOGICAL PROPERTIES OF INCREMENTAL AND BULK-FILL COMPOSITE RESTORATIONS IN ENLARGED OCCLUSAL AND PROXIMAL POSTERIOR CARIOUS CAVITIES

4.6.1 Post-operative hypersensitivity of incremental and bulk-fill composite restorations in enlarged occlusal and proximal posterior carious cavities.

4.6.1.1 Post-operative hypersensitivity of incremental composite restorations.

The post-operative hypersensitivity at baseline, 3 months, and 6 months for all the incremental composite restorations had clinically excellent outcomes. However, at 12 months, 2.4% of the

incremental composite restorations had dropped to a clinically good outcome, i.e., 2.4% of the participants had minor hypersensitivity for a limited period of time (score 2) (Table 9).

Table 9: Clinical scores for postoperative hypersensitivity at various evaluation periods for incremental composite restorations.

Clinical score	Evaluation period			
	Baseline (n%)	3 months (n%)	6 months (n%)	12 months (n%)
1	37 (100.0)	37 (100.0)	37 (100.0)	34 (97.1)
2	0(0.0)	0(0.0)	0(0.0)	1(2.4)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.6.1.2 Post-operative hypersensitivity of bulk-fill composite restorations

The post-operative hypersensitivity at baseline, 3 months, 6 months, and 12 months for all the bulk-fill composite restorations retained clinically excellent outcomes. I.e., no tooth showed any post-operative hypersensitivity within the evaluation period (Table 10).

Table 10: Clinical scores for post-operative hypersensitivity at various evaluation periods for bulk-fill composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)

1	37 (100.0)	37 (100.0)	37 (100.0)	35 (100.0)
2	0(0.0)	0(0.0)	0(0.0)	0(0.0)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.6.2 Recurrent caries of incremental and bulk-fill composite restorations in enlarged occlusal and proximal posterior carious cavities.

4.6.2.1 Recurrent caries of incremental composite restorations

All the incremental composite restorations maintained a clinically excellent outcome for recurrent caries as at the 6-month review, but at 12 months, 2.4% of the incremental composite restorations had dropped to a clinically good outcome (score 2), evidenced by small, localized demineralization (Table 11).

Table 11: Clinical scores for recurrent caries at various evaluation periods for incremental composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	37 (100.0)	37 (100.0)	37 (100.0)	34 (97.1)
2	0(0.0)	0(0.0)	0(0.0)	1(2.4)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.6.2.2 Recurrent caries of bulk-fill composite restorations

Up till the 6-month recall, all the bulk-fill composite restorations maintained a clinically excellent outcome for recurrent caries, but at 12 months, 2.4% of the bulk-fill composite restorations had, dropped to a clinically good outcome, evidenced by small, localized areas of demineralization (Table 12).

Table 12: Clinical scores for recurrent caries at various evaluation periods for bulk-fill composite restorations.

Clinical score	Evaluation period			
	Baseline n(%)	3 months n(%)	6 months n(%)	12 months n(%)
1	37(100.0)	37(100.0)	37(100.0)	34 (97.1)
2	0(0.0)	0(0.0)	0(0.0)	1(2.4)
3	0(0.0)	0(0.0)	0(0.0)	0(0.0)
4	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5	0(0.0)	0(0.0)	0(0.0)	0(0.0)

4.7 COMPARISON OF FUNCTIONAL PROPERTIES OF INCREMENTAL AND BULK-FILL COMPOSITE RESTORATIONS IN ENLARGED OCCLUSAL AND PROXIMAL POSTERIOR CARIOUS CAVITIES

4.7.1 Fracture of material/retention

At baseline, 3 months and 6 months, the fracture of material/ retention of the bulk-fill and incremental composite restorations were clinically excellent in all cavities treated (p-value=1.000) (Table 13).

By 12 months, the fracture of material/retention of the bulk-fill composite restorations had dropped by 5.7% to a clinically good outcome, while 100% of the incremental composite restorations maintained a clinically excellent outcome. There was no statistically significant difference between both groups (p-value=0.151) (Table 13).

4.7.2 Marginal adaptation

At baseline and 3 months, the marginal adaptation of the bulk-fill and incremental composite restorations were clinically excellent in all cavities treated (p-value=1.000) (Table 13).

By the 6-month review the marginal adaptation of the bulk-fill composite restorations was 94.6% clinically excellent with a drop of 5.4% to a clinically good outcome while that of the incremental composite restorations maintained a clinically excellent outcome (p-value=0.152) (Table 13).

There was a further drop in clinically excellent outcome of marginal adaptation in both bulk-fill (82.9%) and incremental composite restorations (91.4%) at the 12-month review. Clinically good outcomes of 17.1% and 8.6% were recorded for bulk-fill and incremental composite restorations respectively. However, there was no statistically significant difference noted between both restorations (p-value=0.284) (Table 13).

4.7.3 Approximal anatomical form-contact point

The approximal anatomical form-contact point maintained a clinically excellent outcome for both the bulk-fill and incremental composite restorations throughout the 12-month period (p-value=1.000) (Table 13).

All the restorations were clinically acceptable over the 12-month period. There was no statistically significant difference in fracture of material/retention, marginal adaptation and approximal anatomical form-contact point between the two groups (Table 13).

Table 13: Comparison of the clinical scores of functional properties for incremental and bulk-fill composite restorations at each evaluation period.

Evaluation period																
Clinical score	Baseline				3 Months				6 months				12 months			
	BF n(%)	Inc n(%)	f	p	BF n(%)	Inc n(%)	f	p	BF n(%)	Inc n(%)	f	p	BF n(%)	Inc n(%)	f	P
Fracture of material/ retention																
1	37 (100.0)	37 (100.0)	0.000	1.000	37 (100.0)	37 (100.0)	0.000	1.000	37 (100.0)	37 (100.0)	0.000	1.000	33 (94.3)	35 (100.0)	1.14	0.151
2	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			2(5.7)	0(0.0)		
3	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
4	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
5	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
Marginal adaptation																
1	37 (100.0)	37 (100.0)	0.000	1.000	37 (100.0)	37 (100.0)	0.000	1.000	35 (94.6)	37 (100.0)	1.34	0.152	29 (82.9)	32 (91.4)	1.37	0.284
2	0(0.0)	0(0.0)			0(0.0)	0(0.0)			2(5.4)	0(0.0)			6 (17.1)	3(8.6)		
3	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
4	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		

5	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
Approximal anatomical form-contact point																
1	8	8	0.000	1.000	8	8	0.000	1.00	8	8	0.00	1.000	8	8	0.00	1.000
	(100.0)	(100.0)			(100.0)	(100.0)			(100.0)	(100.0)			(100.0)	(100.0)		
2	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
3	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
4	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
5	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		

***f=Fisher's exact use; 1: Clinically excellent; 2: Clinical good; 3: Clinically satisfactory; 4: Clinically unsatisfactory; 5. Clinically poor
Assessment of approximal anatomical form-contact point is limited to only teeth with proximal cavities.*

p = p value; significant < 0.05

Inc-incremental composite restoration

BF- bulk-fill composite restoration

4.8 COMPARISON OF BIOLOGICAL PROPERTIES OF INCREMENTAL AND BULK-FILL COMPOSITE RESTORATIONS IN ENLARGED OCCLUSAL AND PROXIMAL POSTERIOR CARIOUS CAVITIES

4.8.1 Post-operative hypersensitivity

At baseline, 3 months, and 6 months the post-operative hypersensitivity of the bulk-fill and incremental composite restorations remained clinically excellent in all cavities treated (p-value=1.000). By 12 months, 2.4% of the incremental composite restorations had dropped to a clinically good outcome while the bulk-fill composite restorations remained 100% clinically excellent (p-value=0.314) (Table 14).

4.8.2 Recurrent caries

At baseline, 3 months, and 6 months the recurrent caries of the bulk-fill and incremental composite restorations remained clinically excellent in all cavities treated (p-value=1.000) (Table 14). By 12 months both the bulk-fill and incremental composite restorations had dropped by 2.4% to a clinically good outcome (p-value=1.000) (Table 14).

All the restorations were clinically acceptable. There was no statistically significant difference in post-operative hypersensitivity and recurrent caries between the two groups (Table 14).

Table 14: Comparison of the clinical scores of biological properties of incremental and bulk-fill composite restorations at each evaluation period

Evaluation period																
Baseline					3 Months				6 months				12 months			
Clinical score	BF n(%)	Inc n(%)	F	p	BF n(%)	Inc n(%)	f	p	BF n(%)	Inc n(%)	f	P	BF n(%)	Inc n(%)	f	p
Post-operative hypersensitivity																
1	37	37	0.000	1.000	37	37	0.000	1.000	37	37	0.000	1.000	35	34	0.000	0.314
	(100.0)	(100.0)			(100.0)	(100.0)			(100.0)	(100.0)			(100.0)	(97.1)		
2	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	1(2.4)		
3	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
4	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
5	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		

Recurrent caries

1	37	37	0.000	1.000	37	37	0.000	1.000	37	37	0.000	1.000	34	34	0.000	1.000
	(100.0)	(100.0)			(100.0)	(100.0)			(100.0)	(100.0)			(97.1)	(97.1)		
2	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			1(2.4)	1(2.4)		
3	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
4	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		
5	0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)			0(0.0)	0(0.0)		

***Fisher's exact use; 1: Clinically excellent; 2: Clinical good; 3: Clinically satisfactory; 4: Clinically unsatisfactory; 5. Clinically poor*
p = p value; significant < 0.05

Inc-incremental composite restoration

BF- bulk-fill composite restoration

4.9 ASSOCIATION BETWEEN CRITERIA THAT HAD CLINICAL SCORES OF 2 AT THE END OF 1 YEAR EVALUATION AND CHARACTERISTICS OF AGE, GENDER, TEETH TYPE, JAW, SIDE OF MOUTH AND CAVITY TYPE

At 1-year evaluation, this study further assessed the criteria that had dropped from clinically excellent scores (score 1) to clinically good scores (score 2) in relation to age, gender, teeth type, jaw involved, side involved and type of cavity. These criteria were found out to be fracture of material/retention, marginal adaptation, post-operative hypersensitivity, and recurrent carries. These criteria were assessed to determine if there was an association between certain characteristics and the drop in clinical outcome of these two composite restorative techniques.

4.9.1 Association between fracture of material/retention selected characteristics

All the incremental composite restorations maintained a clinically excellent outcome at the end of the one-year evaluation of fracture of material/retention, with none showing evidence of either fracture of the material or loss of retention (score 2). However, in the bulk-fill composite restorations, even though there was no statistical significance between the variables, two of the restorations showed evidence of either fracture of material or loss of retention (score 2) at the end of the one-year assessment. Both two restorations with score of 2 fell within the 21-30 age group, both occurred in females, both occurred in the second molar, and also in the mandible, one was on the left while the other was on the right and both of them were on occlusal cavities. (Table 15).

Table 15: Association between fracture of material/retention and selected characteristics

Characteristics	Bulk-fill composite		p-value	Incremental composite		p-value
	Clinical	Clinical		Clinical	Clinical	
	score 1	score 2		score 1	score 2	
	n(%)	n(%)		n(%)	n(%)	
Age group (Years)						
≤20	6(100.0)	0(0.0)	0.810	6(100.0)	0(0.0)	1.000
21-30	18(90.0)	2(10.0)		20(100.0)	0(0.0)	
31-40	3(100.0)	0(0.0)		3(100.0)	0(0.0)	
41-50	4(100.0)	0(0.0)		4(100.0)	0(0.0)	
>50	2(100.0)	0(0.0)		2(100.0)	0(0.0)	
Gender						
Male	7(100.0)	0(0.0)	0.466	7(100.0)	0(0.0)	1.000
Female	26(92.9)	2(7.1)		28(100.0)	0(0.0)	
Teeth type						
First premolar	3(100.0)	0(0.0)	0.702	3(100.0)	0(0.0)	1.000
Second premolar	4(100.0)	0(0.0)		6(100.0)	0(0.0)	
First molar	7(100.0)	0(0.0)		10(100.0)	0(0.0)	
Second molar	19(90.5)	2(9.5)		16(100.0)	0(0.0)	
Jaw						
Maxilla	17(100.0)	0(0.0)	0.157	19(100.0)	0(0.0)	1.000
Mandible	16(88.9)	2(11.1)		16(100.0)	0(0.0)	
Side						
Right	13(92.9)	1(7.1)	0.766	14(100.0)	0(0.0)	1.000
Left	20(95.2)	1(4.8)		21(100.0)	0(0.0)	
Cavity						1.000
Occlusal	25(92.6)	2(7.4)	0.428	27(100.0)	0(0.0)	
Proximal	8(100.0)	0(0.0)		8(100.0)	0(0.0)	

***f=Fisher's exact use; 1: Clinically excellent; 2: Clinical good; 3: Clinically satisfactory; 4: Clinically unsatisfactory; 5. Clinically poor*

p = p value; significant < 0.05

Inc-incremental composite restoration

BF- bulk-fill composite restoration

4.9.2 Association between marginal adaptation and selected characteristics

The marginal adaptation of both the incremental and bulk-fill composite restorative techniques showed no statistical significance in terms of gender, teeth type, jaw, side of the mouth and cavity type. There was also no statistical significance in the outcome of incremental composite in relation to age.

In the incremental composite restorations, there were 3 restorations that dropped to a clinically good score, evidenced by slight ditching and minor irregularities (score 2), one of which occurred in ≤ 20 years of age and the remaining two between 21-30 years. Restorations in the older age groups had no drop in clinical scores. All the three restorations were seen in females, and the most affected teeth were the second molars (2) followed by the first molar (1). The maxilla had two restorations with a clinical score of 2 while the mandible had one. Two occurred in the right while one occurred in the left and all the three restorations were seen in occlusal cavities (Table 16).

The marginal adaptation of six of the bulk-fill composites showed slight ditching and minor irregularities (score 2), with four of them falling within the 21-30 age group, none of the restorations in the 31-40 and 41-50 age groups fell to a score of 2. and two restorations fell within the >50 age group. There was a statistically significant relation between age and the drop in clinical score to 2 in bulk fill composite restoration, where all (2) of the bulk fill restorations in the >50 age group had a clinical score of 2 and four of the 20 participants in the 21- 30 age group had a score of 2 (Table 16).

Of the 6 restorations that dropped to a score of 2, one occurred in a male and five in females, two occurred on the second premolar while four occurred in the second molar, two occurred in the

maxilla and four in the mandible. Two on the right, four on the left, and four occurred in occlusal cavities while two occurred in proximal cavities (Table 16).

Table 16: Association between marginal adaptation and selected characteristics

Characteristics	Bulk-fill composite			Incremental composite		
	Clinical score 1 n(%)	Clinical score 2 n(%)	p-value	Clinical score 1 n(%)	Clinical score 2 n(%)	p-value
Age group (Years)						
≤20	6(100.0)	0(0.0)	0.014*	5(83.3)	1(16.7)	0.845
21-30	16(80.0)	4(20.0)		18(90.0)	2(10.0)	
31-40	3(100.0)	0(0.0)		3(100.0)	0(0.0)	
41-50	4(100.0)	0(0.0)		4(100.0)	0(0.0)	
>50	0(0.0)	2(100.0)		2(100.0)	0(0.0)	
Gender						
Male	6(85.7)	1(14.3)	0.823	7(100.0)	0(0.0)	0.365
Female	23(82.1)	5(17.9)		25(89.3)	3(10.7)	
Teeth type						
First premolar	3(100.0)	0(0.0)	0.160	3(100.0)	0(0.0)	0.757
Second premolar	2(50.0)	2(50.0)		6(100.0)	0(0.0)	
First molar	7(100.0)	0(0.0)		9(90.0)	1(10.0)	
Second molar	17(81.0)	4(19.0)		14(87.5)	2(12.5)	
Jaw						
Maxilla	15(88.2)	2(11.8)	0.412	17(89.5)	2(10.5)	0.653
Mandible	14(77.8)	4(22.2)		15(93.5)	1(6.3)	
Side						
Right	12(85.7)	2(14.3)	0.714	13(92.9)	1(7.1)	0.8.05
Left	17(81.0)	4(19.0)		19(90.5)	2(9.5)	
Cavity						
Occlusal	23(85.2)	4(14.8)	0.502	24(88.9)	3(11.1)	0.324
Proximal	6(75.0)	2(25.0)		8(100.0)	0(0.0)	

***f=Fisher's exact use; 1: Clinically excellent; 2: Clinical good; 3: Clinically satisfactory; 4: Clinically unsatisfactory; 5. Clinically poor*

p = p value; significant < 0.05

Inc-incremental composite restoration

BF- bulk-fill composite restoration

4.9.3 Association between post-operative hypersensitivity and selected characteristics

One of the incremental composite restorations had dropped to a clinical score of 2 evidenced by minor hypersensitivity by the one-year evaluation, and this was found in the 21-30 year age group, was female, occurred on the first molar, in the mandible on the right and was in an occlusal cavity (Table 17).

All the bulk fill composite restorations assessed for post operative hypersensitivity within one year evaluation, however maintained the clinically excellent evaluation score of 1 (Table 17).

Table 17: Association between post-operative hypersensitivity and selected characteristics

Characteristics	Bulk-fill composite			Incremental composite		
	Clinical score 1 n(%)	Clinical score 2 n(%)	p-value	Clinical score 1 n(%)	Clinical score 2 n(%)	p-value
Age group (Years)						
≤20	6(100.0)	0(0.0)	1.000	6(100.0)	0(0.0)	0.942
21-30	20(100.0)	0(0.0)		19(95.0)	1(5.0)	
31-40	3(100.0)	0(0.0)		3(100.0)	0(0.0)	
41-50	4(100.0)	0(0.0)		4(100.0)	0(0.0)	
>50	2(100.0)	0(0.0)		2(100.0)	0(0.0)	
Gender						
Male	7(100.0)	0(0.0)	1.000	7(100.0)	0(0.0)	0.612
Female	28(100.0)	0(0.0)		27(96.4)	1(3.6)	
Teeth type						
First premolar	3(100.0)	0(0.0)	1.000	3(100.0)	0(0.0)	0.462
Second premolar	6(100.0)	0(0.0)		6(100.0)	0(0.0)	
First molar	10(100.0)	0(0.0)		9(90.0)	1(10.0)	
Second molar	16(100.0)	0(0.0)		16(100.0)	0(0.0)	
Jaw						
Maxilla	19(100.0)	0(0.0)	1.000	19(100.0)	0(0.0)	0.269
Mandible	16(100.0)	0(0.0)		15(93.8)	1(6.3)	
Side						
Right	14(100.0)	0(0.0)	1.000	13(92.9)	1(7.1)	0.214
Left	21(100.0)	0(0.0)		21(100.0)	0(0.0)	
Cavity						
Occlusal	27(100.0)	0(0.0)	1.000	26(96.3)	1(3.7)	0.581
Proximal	8(100.0)	0(0.0)		8(100.0)	0(0.0)	

***f=Fisher's exact use; 1: Clinically excellent; 2: Clinical good; 3: Clinically satisfactory; 4: Clinically unsatisfactory; 5. Clinically poor*

p = p value; significant < 0.05

Inc-incremental composite restoration

BF- bulk-fill composite restoration

4.9.4 Association between recurrent caries and selected characteristics

In the incremental composite restorations, there was only one restoration that dropped from a score of 1 to score of 2 (small, localized demineralization). And this was seen in the ≤ 20 years age group who was female, occurred in the first molar, on the left side of the mandible and it was an occlusal cavity (Table 18).

In the bulk fill composite restorations, there was also one restoration that dropped to a clinical score of 2 and it was also seen in the ≤ 20 years age group, who was female, and it occurred in the mandible on the left side. And it was a proximal cavity. All these assessments except the teeth type showed no clinical significance in outcome. However, when the teeth type was analysed, there was a statistically significant relationship between teeth size and reduction in the outcome from a score of 1 to score of 2. The only drop in outcome from 1 to 2 was seen in the second premolar (Table 18).

Table 18: Association between recurrent caries and selected characteristics

Characteristics	Bulk-fill composite		p-value	Incremental composite		p-value
	Clinical score 1 n(%)	Clinical score 2 n(%)		Clinical score 1 n(%)	Clinical score 2 n(%)	
Age group (Years)						
≤20	5(83.3)	1(16.7)	0.290	5(83.3)	1(16.7)	0.290
21-30	20(100.0)	0(0.0)		20(100.0)	0(0.0)	
31-40	3(100.0)	0(0.0)		3(100.0)	0(0.0)	
41-50	4(100.0)	0(0.0)		4(100.0)	0(0.0)	
>50	2(100.0)	0(0.0)		2(100.0)	0(0.0)	
Gender						
Male	7(100.0)	0(0.0)	0.612	7(100.0)	0(0.0)	0.612
Female	27(96.4)	1(3.6)		27(96.4)	1(3.6)	
Teeth type						
First premolar	3(100.0)	0(0.0)	0.046*	3(100.0)	0(0.0)	0.62
Second premolar	3(75.0)	1(25.0)		6(100.0)	0(0.0)	
First molar	7(100.0)	0(0.0)		9(90.0)	1(10.0)	
Second molar	21(100.0)	0(0.0)		6(100.0)	0(0.0)	
Jaw						
Maxilla	17(100.0)	0(0.0)	0.324	18(94.7)	1(5.3)	0.352
Mandible	17(94.4)	1(5.6)		16(100.0)	0(0.0)	
Side						
Right	14(100.0)	0(0.0)	0.407	14(100.0)	0(0.0)	0.407
Left	20(95.2)	1(4.8)		20(95.2)	1(4.8)	
Cavity						
Occlusal	7(100.0)	0(0.0)	0.062	8(96.3)	1(3.7)	0.581
Proximal	7(87.5)	1(12.5)		8(100.0)	0(0.0)	

***f=Fisher's exact use; 1: Clinically excellent; 2: Clinical good; 3: Clinically satisfactory; 4: Clinically unsatisfactory; 5: Clinically poor*

p = p value; significant < 0.05

Inc-incremental composite restoration

BF- bulk-fill composite restoration

