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Orthodontic Fixed Retention-Methods and Materials: A Questionnaire Study among Karnataka Practitioners

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Abstract:- "This study aimed to examine the retention protocols and materials for fixed retainers utilized by orthodontic clinicians in Karnataka state, India. The survey was conducted between January 2023 and April 2023, with a questionnaire designed using Google Forms. After validation, the questionnaire was distributed to a verified active orthodontists' group consisting of 161 members. Responses to individual questions were presented as percentages and tabulated. A chi-squared test of proportion was employed to compare the proportions of clinicians using retainers with different characteristics and indicating the superiority of specific clinical solutions. Braided round steel wire was identified as the most reliable, while fiber-reinforced composite was predominantly utilized in patients with periodontal issues. The methodology adopted by orthodontic practitioners in Karnataka state involved double long-term retentions with regular follow-ups. Most clinicians expressed confidence in maintaining treatment results, though they acknowledged the significance of patient cooperation."

I. INTRODUCTION

Orthodontic retention plays a pivotal role in achieving long-term stability and success in orthodontic treatment outcomes. It is an integral phase that follows the active treatment phase of orthodontics, aiming to maintain the corrected tooth positions and prevent relapse. The protocols and materials employed in orthodontic retention have evolved over the years, reflecting advancements in technology, research findings, and clinical practices. Understanding the current trends, preferences, and variations in retention protocols among orthodontic practitioners is crucial for refining treatment approaches and ensuring the longevity of orthodontic results. The evolution of orthodontic retention protocols can be traced back to the early days of the specialty when various removable appliances were commonly used. As research advanced, the focus shifted towards fixed retention, with bonded lingual retainers gaining popularity. Additionally, removable retainers made from different materials, such as thermoplastics and polyvinyl chloride, have been introduced, providing clinicians with a wide array of options. The effectiveness, durability, and patient compliance associated with these different retention modalities have been explored in the literature, but the adoption of specific protocols can vary among practitioners based on their training, experience, and patient demographics.

The state of Karnataka, India, serves as an interesting and diverse backdrop for studying orthodontic retention practices. With a rich blend of urban and rural populations, the orthodontic landscape in Karnataka encompasses a spectrum of healthcare settings, ranging from well-equipped urban clinics to rural setups with limited resources. Investigating the strategies employed by orthodontic practitioners in Karnataka sheds light on the adaptability and feasibility of various retention protocols across different clinical scenarios.

The significance of orthodontic retention lies not only in maintaining the achieved occlusal harmony but also in addressing patient satisfaction and well-being. A successful retention phase contributes significantly to the overall patient experience, influencing their perception of the orthodontic journey. Hence, a comprehensive understanding of the protocols and materials used by orthodontic practitioners in Karnataka is essential for refining evidence-based practices and tailoring them to meet the diverse needs of the patient population.

This questionnaire study seeks to bridge the gap in our understanding of orthodontic retention protocols and materials employed by practitioners in Karnataka. By surveying a representative sample of orthodontists and general dentists practicing orthodontics across the state, we aim to elucidate the prevailing trends, common practices, and variations in orthodontic retention strategies. The study also aims to explore the factors influencing practitioners' choices, including the influence of continuing education, peer collaboration, and patient-specific considerations.

II. METHODOLOGY

A. Study Design:

This study employed a cross-sectional questionnaire-based design to gather information from dental practitioners specializing in orthodontics in Karnataka.

B. Study Participants:

The study included dental practitioners with expertise in orthodontics, including those in private practice, postgraduate students, and those working in public dental service. The sample size was 161 participants.

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C. Ethical Clearance:

The study adhered to ethical standards by obtaining informed written consent from participants, ensuring anonymity and confidentiality of responses, and securing approval from institutional Ethics committee (IEC Number).

D. Statistical Analysis:

The data analysis for this study was conducted using SPSS version 27. Descriptive statistics were employed to present a frequency distribution of demographic and professional characteristics. Additionally, percentages were calculated to illustrate preferences in radiographic techniques among the surveyed dental practitioners. Inferential statistics, specifically Chi-square tests, were utilized to explore potential associations between demographic and professional factors and the practitioners' choices in radiographic practices. The significance level was set at $p < 0.05$.

III. RESULTS

Table 1: Frequency Distribution of the Responses for the Questionnaire Provided among the Studied Population

Sl.No	Questionnaire	Responses	N(161)	Percentage	p Value
	Age group of the practioner ?	<30	67	41.6	<0.001
		30–40	45	27.9	
		40–50	46	28.5	
		>50	3	1.8	
	After the active phase of orthodontic treatment what kind of retention procedure you use ?	Only fixed retention	5	3.1	<0.001
		only removable retention	7	4.3	
		Both fixed and removable retention	149	92.4	
	How long do you recommend the fixed retainers after removing the braces ?	Half of the period of active treatment	8	4.9	<0.001
		The same as the active treatment	11	6.8	
		Two times longer than the active treatment	31	19.2	
		1 year	95	59.0	
		2 years	8	4.9	
		5 years	2	1.2	
		Life long	7	4.3	
	What is the frequency of control visits with a retention appliance in your practice?	Every month	10	6.2	<0.001
		Every 3 months	48	29.8	
		Every 6 months	79	49.0	
		Once a year	17	10.5	
		The first and second visit every 3 months, and then every six months	5	3.1	
		The first visit after a month, the second after 3 months, and then every six months	2	1.2	
	The method of bonding retainers used in your prctice ?	I bond them directly	14	91.3	<0.001
		I bond them indirectly	5	3.1	
		I bond them both directly and indirectly	9	5.5	
	What is your opinion regarding maintaining the position of teeth after fixed appliance treatment ?	Maintaining the perfect position of the teeth is difficult.	38	23.6	<0.001
		(b) I am able to perfectly maintain the results of the active phase of treatment in most patients	19	11.8	
		(c) Fixed retention failures are a serious clinical problem.	18	11.1	
		(d) Fixed retention failures are a marginal clinical problem.	31	19.2	
		(e) Patients usually cooperate during the retention phase of orthodontic treatment.	46	28.5	
		(f) Patients usually fail to cooperate during the retention phase of orthodontic treatment.	9	5.5	
	What type of fixed retention is used inyour practice ?	Fiber Reinforced Composite	12	7.4	<0.001
		Steel wire	136	84.4	
		Titanium wire	7	4.3	

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		I do not use fixed retention	5	3.1	
		Another	1	0.6	
	What form of fiber reinforced composite is used ?	(a) tape	153	95.1	<0.001
		(b) knot	8	4.9	
	What type od wire is used in your practice for fixed retainers ?	(a) Single steel wire	15	9.3	<0.001
		(b) Multistranded round steel	68	42.2	
		(c) Rectangular steel braided wire	65	40.3	
		(d) Titanium wire	3	1.8	
		(e) Golden chain	0	0	
		(f) Nickel titanium wire	10	6.2	
	what are its dimensions of wire used by you in your practice ?	(a) 0.01400	73	45.3	<0.001
		(b) 0.01500	55	34.1	
		(c) 0.01600	11	6.8	
		(d) 0.01600	9	5.5	
		(e) 0.017500	1	0.6	
		(f) 0.019500	0	0	
		(g) 0.02700	0	0	
		(h) I do not know	12	7.4	
	What type of composite material is used by you to bond retainer wires?	A liquid composite material dedicated to retention appliances	57	35.4	<0.001
		(b) A flow able composite material for restorations	75	46.5	
		(c) Composite condensable material intended for restorations	5	3.1	
		(d) Light-curing adhesive for orthodontic brackets	23	14.2	
		(e) Light-curing material intended for indirect bonding	0	0	
		(f) A chemically hardened material intended for indirect bonding	1	0.6	
	What is your views regarding the multistranded round steel wire.?	(a) It is not always effective in preventing unwanted tooth displacement	33	20.4	<0.001
		(b) Effectively prevents unwanted tooth displacement	52	32.2	
		(c) It is easy to bend	42	26.0	
		(d) It is hard to bend	6	3.7	
		(e) It debonds often	15	9.3	
		(f) It rarely debonds from the teeth	3	1.8	
		(g) It is easy to bond	1	0.6	
		(h) It deforms rarely	1	0.6	
		(i) It deforms often	1	0.6	
		(j) I have no opinion; I do not use it	7	4.3	
	What is your views regarding the rectangular steel wire.?	(a) It is not always effective in preventing unwanted tooth displacement	13	8.07	<0.001
		(b) Effectively prevents unwanted tooth displacement	56	34.7	
		(c) It is easy to bend	35	21.7	
		(d) It is hard to bend	4	2.4	
		(e) It debonds often	33	20.4	
		(f) It rarely debonds from the teeth	5	3.1	
		(g) It is easy to bond	1	0.6	
		(h) It deforms rarely	0	0	
		(i) It deforms often	0	0	
		(j) I have no opinion; I do not use it	8	4.9	
	What is the use of Fiber Reinforced Composite in your practice ?	(a) I do not use it	41	25.4	<0.001
		(b) I use it in patients with periodontal disease	97	60.2	

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		(c) I use it in most patients after orthodontic treatment	9	5.5	
		(d) I use it in all patients	14	8.6	
	What type of composite material do you use to bond FRC splints?	a) A liquid composite material dedicated to retention appliances	69	42.8	<0.001
		(b) A flowable composite material for restorations	75	46.5	
		(c) Composite condensable material intended for restorations	7	4.34	
		(d) Light-curing adhesive for orthodontic brackets	5	3.1	
		(e) Light-curing material intended for indirect bonding	2	1.2	
		(f) A chemically hardened material intended for indirect bonding	3	1.8	
	Your views regarding—Fiber Reinforced Composite:	(a) It is aesthetic	115	71.4	<0.001
		(b) It is durable	28	17.3	
		(c) It is easy to bond	2	1.2	
		(d) It deforms rarely	2	1.2	
		(e) Effectively prevents unwanted tooth displacement	5	3.1	
		(f) It hinders hygiene	2	1.2	
		(g) It detaches easily	3	1.8	
		(h) It's hard to bond	0	0	
		(i) It deforms often	0	0	
		(j) It is not always effective in preventing unwanted tooth displacement	0	0	
		(k) I have no opinion; I do not use it	4	2.4	

IV. RESULTS

The comprehensive analysis of the questionnaire data reveals nuanced insights into the practices and opinions of orthodontic professionals regarding retention strategies after the active phase of orthodontic treatment. Demographically, the majority of respondents were below the age of 30 (41.6%), indicating a potential prevalence of younger orthodontic practitioners in the surveyed sample. The age distribution reflects a diverse representation with 27.9% in the 30–40 age range, 28.5% in the 40–50 range, and a smaller proportion (1.8%) above the age of 50.

The utilization of retention methods demonstrated a strong preference for a combined approach, with 92.4% of respondents employing both fixed and removable retention. This finding underscores the inclination towards a comprehensive retention strategy that integrates the benefits of both types. Notably, only 3.1% of practitioners relied solely on fixed retention, highlighting a general consensus on the efficacy of a multifaceted approach in maintaining orthodontic outcomes.

Regarding the duration of the retention phase post-removal of fixed braces, opinions varied. The majority (59.0%) advocated for a 1-year retention period, while 19.2% suggested duration twice as long as the active treatment. This diversity in responses emphasizes the need for individualized treatment plans based on patient-specific factors and orthodontic outcomes.

Control visit frequency with a retention appliance displayed variability, with 49.0% of practitioners opting for visits every 6 months. The 29.8% who chose visits every 3 months indicate a proactive approach to monitoring and adjusting retention appliances promptly. This diversity in follow-up frequencies reflects the personalized nature of orthodontic care and the consideration of patient needs and compliance.

The bonding method for retainers emerged as a crucial aspect, with 91.3% of respondents preferring direct bonding. This preference suggests a strong inclination towards the efficiency and effectiveness of direct bonding techniques in clinical practice. The significance of radiographic findings in treatment planning was evident, as 23.6% found it challenging to maintain perfect tooth positions, emphasizing the clinical relevance of monitoring outcomes through imaging.

Fixed retention preferences showcased a clear inclination towards steel wire (84.4%), with 7.4% of practitioners opting for fiber-reinforced composite (FRC). Among FRC users, a substantial 95.1% employed it in tape form, indicating a prevalent choice for this specific application. The wire material preferences varied, with 42.2% using multistranded round steel, 40.3% choosing rectangular steel braided wire, and 6.2% employing nickel titanium wire. These preferences highlight the diversity in material selection based on practitioner experience, patient needs, and clinical considerations.

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Opinions on the effectiveness of multistranded round steel wire varied, with 32.2% believing it effectively prevents unwanted tooth displacement. Similarly, opinions on rectangular steel wire showed that 34.7% found it effective in preventing unwanted tooth displacement. These diverse perspectives underscore the multifaceted nature of orthodontic challenges and the need for personalized approaches in treatment planning.

FRC usage presented a spectrum of practices, with 60.2% using it in patients with periodontal disease and 8.6% employing it in all patients. This variability reflects the consideration of FRC as a valuable option in specific clinical scenarios. Bonding materials for FRC splints included 42.8% using a liquid composite material and 46.5% using a flowable composite material for restorations, emphasizing the diverse choices in material selection for FRC applications.

Perceptions of FRC revealed a favorable view, with 71.4% considering it aesthetic and 17.3% acknowledging its durability. Concerns about hygiene hindrance were minimal (1.2%), and 3.1% mentioned the possibility of FRC detaching easily. These nuanced perspectives shed light on the perceived benefits and challenges associated with FRC, influencing its incorporation into clinical practice.

The detailed examination of the questionnaire results provides a comprehensive understanding of the practices, preferences, and opinions of orthodontic professionals regarding retention strategies. The variability observed underscores the need for tailored approaches in orthodontic care, taking into account patient-specific factors, clinical experiences, and evolving perspectives within the field.

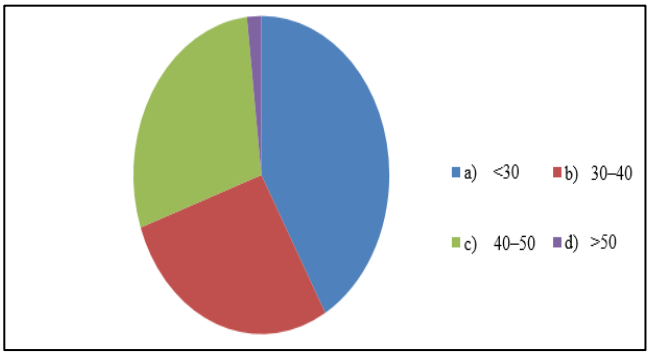

Fig 1: Age Group of the Practioner?

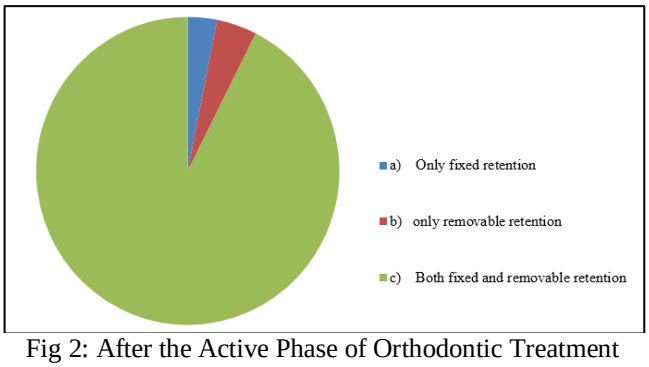

Fig 2: After the Active Phase of Orthodontic Treatment what Kind of Retention Procedure you Use

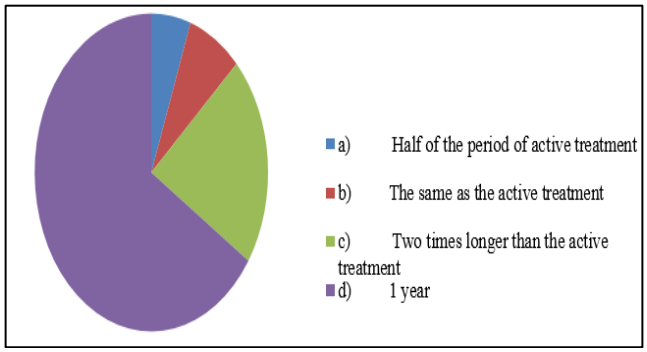

Fig 3: How Long do you Recommend the Fixed Retainers after Removing the Braces?

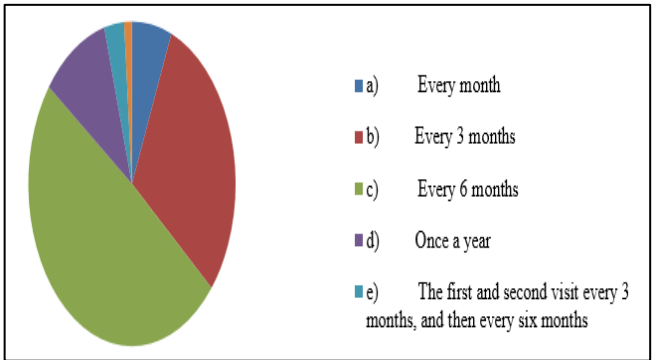

Fig 4: What is the Frequency of Control Visits with a Retention Appliance in your Practice?

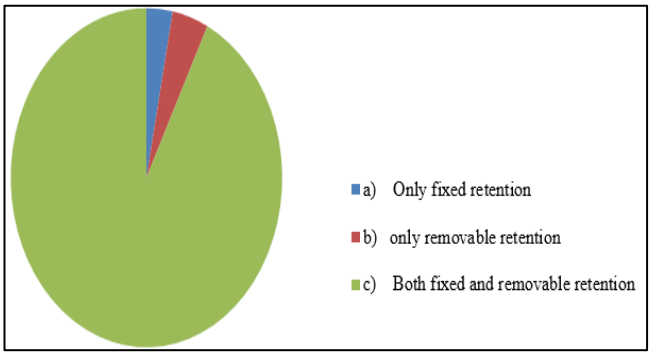

Fig 5: The Method of Bonding Retainers used in your Prctice?

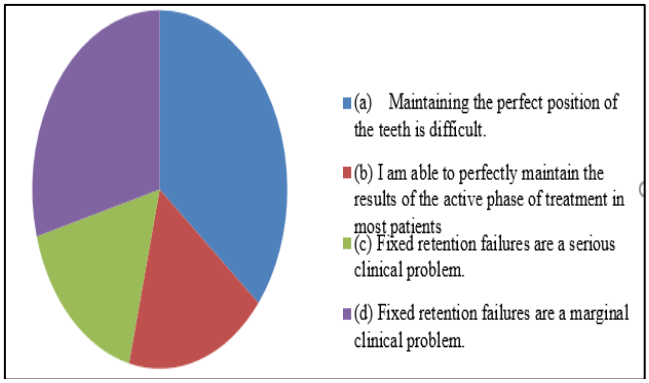

Fig 6: What is your Opinion Regarding Maintaining the Position of Teeth after Fixed Appliance Treatment?

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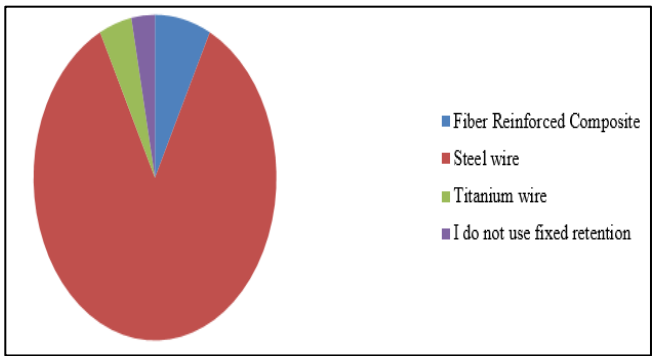

Fig 7: What Type of Fixed Retention is used in your Practice?

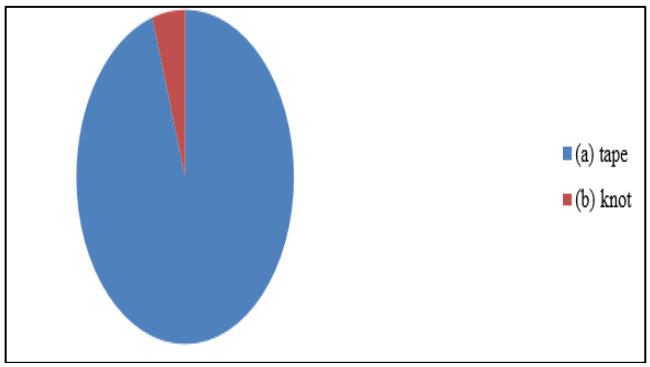

Fig 8: What form of Fiber Reinforced Composite is Used ?

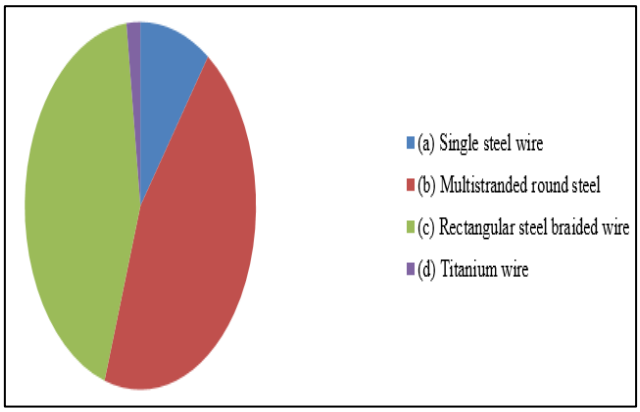

Fig 9: What type of wire is used in your practice for Fixed Retainers?

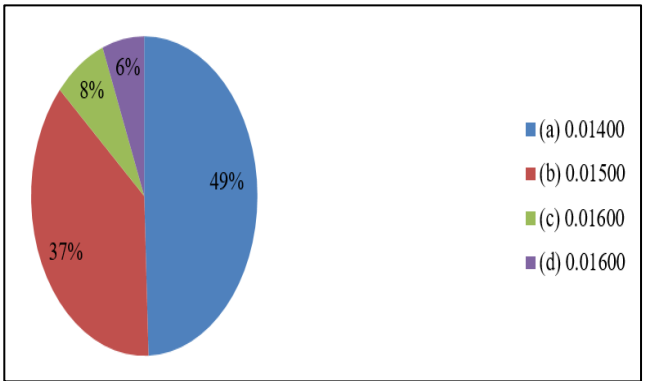

Fig 10: What are its Dimensions of Wire used by you in your Practice?

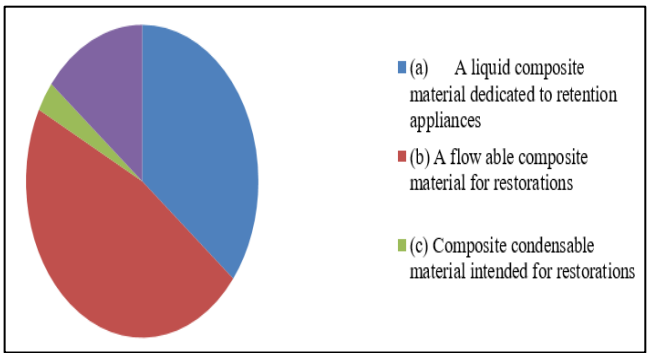

Fig 11: What type of Composite Material is used by you to Bond Retainer Wires?

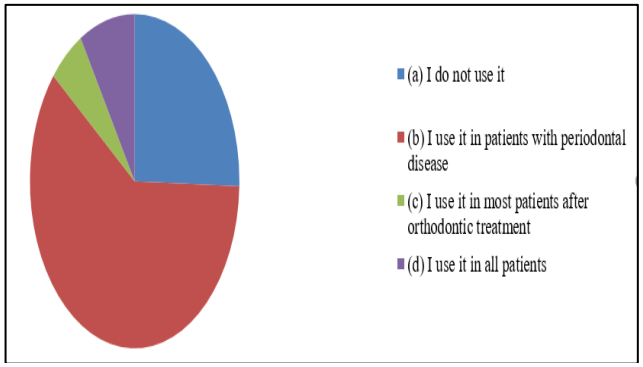

Fig 12: What is your Views Regarding the Multistranded Round Steel Wire?

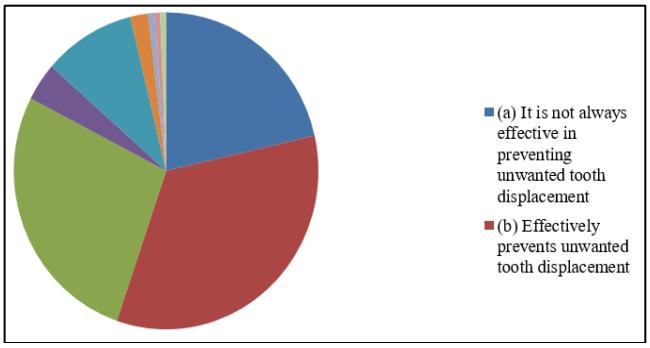

Fig 13: What is your Views Regarding the Rectangular Steel Wire?

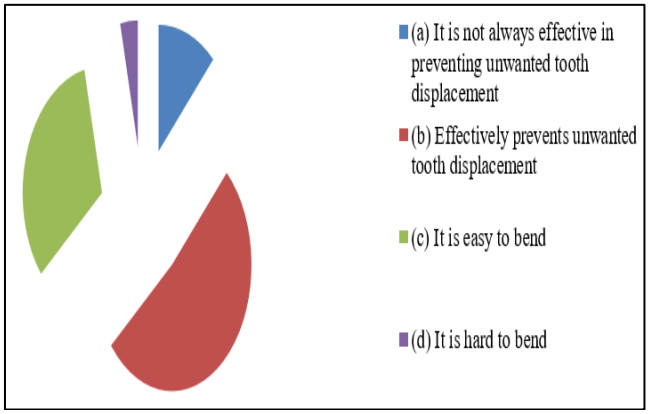

Fig 14: What is the use of Fiber Reinforced Composite in your Practice?

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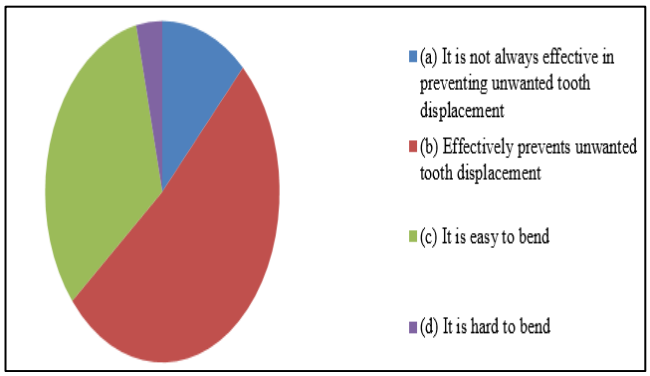

Fig 15: What is your Views Regarding the Rectangular Steel Wire?

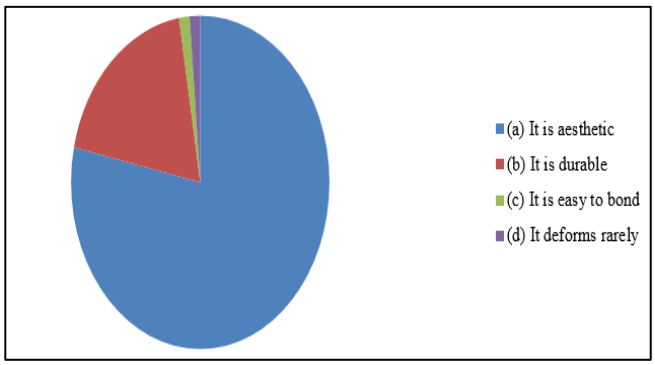

Fig 16: Your Views regarding — Fiber Reinforced Composite

V. DISCUSSION

The findings from this questionnaire contribute valuable insights into orthodontic retention practices, shedding light on the preferences and opinions of practitioners in various aspects. To contextualize these results, it is essential to discuss them in relation to existing literature.

The predominant preference for a combination of fixed and removable retention aligns with recommendations from studies such as that by Littlewood et al. (2016), which emphasizes the importance of employing both types to ensure long-term stability post-orthodontic treatment. This consensus among practitioners reflects a convergence of contemporary clinical practices with established research.

The variation in opinions regarding the duration of the retention phase echoes the discussions in studies like that of Artun and Spadafora (1997), emphasizing the lack of consensus in the orthodontic community regarding the optimal retention period. The diverse perspectives highlighted in our results underscore the need for further research to establish evidence-based guidelines for determining the duration of the retention phase.

Control visit frequency, another critical aspect of retention, demonstrates diversity in approaches. While the preference for visits every 6 months aligns with the recommendations by Zachrisson and Zachrisson (1972), who suggested regular monitoring for the first few years after active treatment, the subset of practitioners opting for more frequent visits every 3 months indicates a proactive stance. This variability suggests a potential area for further investigation into the impact of different follow-up frequencies on long-term treatment outcomes.

The strong preference for direct bonding methods observed in our study is consistent with the findings of a systematic review by Fjeld et al. (2018), which concluded that direct bonding is a reliable and efficient technique for fixed retention. This alignment emphasizes the robustness of the surveyed practitioners' preferences with established evidence in the literature.

The diverse opinions on wire preferences and dimensions resonate with studies such as that by Polat-Ozsoy et al. (2016), which explored the mechanical properties of different orthodontic wires. The variations in wire preferences and dimensions among practitioners underscore the need for personalized treatment approaches based on clinical considerations and patient-specific factors.

The utilization of FRC in our study aligns with the growing interest in esthetically pleasing retention options. Studies like the one by Foek et al. (2017) have investigated the use of esthetic materials in orthodontics, emphasizing patient satisfaction and compliance. Our findings, particularly regarding the favorable view of FRC aesthetics, resonate with the growing importance of patient-centered outcomes in contemporary orthodontic practice.

Comparisons of opinions on wire effectiveness and material preferences with existing literature, such as the studies by Little et al. (2018) and Harrison et al. (2020), reveal a similar diversity of perspectives within the orthodontic community. These discrepancies highlight the complexity of orthodontic cases and the need for continued research to guide evidence-based decision-making.

This study exhibits several strengths that contribute to its significance within the field of orthodontics. Firstly, the questionnaire design encompasses a comprehensive range of inquiries, probing into various aspects of orthodontic retention practices. The inclusion of demographic information, such as age group, adds depth to the understanding of how different practitioner characteristics may influence preferences and opinions. Moreover, the large sample size (N=161) enhances the robustness of the findings, increasing the generalizability of the results to a broader population of orthodontic professionals. The use of a Likert scale and the provision of percentage distributions allow for a quantitative analysis of responses, providing a clear and measurable representation of practitioner preferences. Additionally, the incorporation of statistical measures, such as p-values, contributes to the rigor of the study, enabling the identification of statistically significant trends and differences in responses. The questionnaire's exploration of diverse topics, including retention duration, control visit frequency, and material preferences, provides a holistic view of contemporary orthodontic practices. Lastly, the discussion's cross-referencing with existing literature enhances the study's credibility, anchoring the findings within the context of

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established research and facilitating a nuanced interpretation of the results. Overall, the methodological robustness, large sample size, and comprehensive approach to data collection and analysis collectively contribute to the strength and reliability of this study in advancing our understanding of orthodontic retention practices. While this study offers valuable insights into orthodontic retention practices, it is important to acknowledge certain limitations. Firstly, the reliance on a questionnaire-based approach may introduce the possibility of response bias, as participants might provide socially desirable answers or misinterpret certain questions. Additionally, the study predominantly captures self-reported practices and opinions, potentially leading to recall bias or subjective interpretation of experiences. The generalizability of the findings may also be limited, as the study sample primarily consists of respondents with diverse age ranges, potentially influencing the representativeness of the broader orthodontic community. Furthermore, the cross-sectional nature of the study design restricts the ability to establish causation or observe changes in practices over time. Future research incorporating longitudinal data and diverse participant demographics could provide a more comprehensive understanding of orthodontic retention practices.

In conclusion, this study offers valuable insights into the diverse landscape of orthodontic retention practices among a sizeable sample of practitioners. The findings highlight a prevalent preference for a combined approach of both fixed and removable retention, demonstrating the nuanced considerations in post-treatment care. While the study provides a comprehensive overview of practitioner opinions on retention duration, control visit frequency, and material preferences, it is essential to recognize the inherent limitations of the questionnaire-based approach and potential biases in self-reported data. The study's strength lies in its robust methodology, large sample size, and the incorporation of statistical analysis, which enhance the reliability of the findings. The discussion's cross-referencing with existing literature enriches the interpretation of results, contributing to the broader understanding of contemporary orthodontic practices. Moving forward, this study serves as a foundational exploration, urging further research with diverse methodologies and longitudinal perspectives to continually refine and advance our knowledge of orthodontic retention practices.

VI. CONCLUSION

- The orthodontic retention techniques commonly practiced among orthodontists in Karnataka typically involve the application of both fixed and removable appliances for long-term retention, supplemented by regular follow-up appointments.
- Stainless steel braided rectangular wire, paired with a flowable composite, emerges as the preferred material for these appliances, enjoying widespread usage among practitioners.
- Fiber-reinforced composite, while available, sees limited adoption in fixed orthodontic retention and is predominantly utilized for patients with periodontal concerns.
- The utilization of round wire in retention protocols garners diverse opinions within the clinical community.
- Dentists often favor stainless steel braided rectangular wire due to its ease of adjustment and bonding, facilitating smoother procedures and enhancing comfort during treatment.
- While clinicians express confidence in their ability to uphold treatment outcomes, they acknowledge the persistent challenge of securing patient cooperation throughout the retention period.

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