

# Comparative Evaluation of Effectiveness of Rotary and Hand File Systems in Terms of Quality of Obturation and Instrumentation Time among Primary Teeth: A Systematic Review and Meta-analysis of Randomized Controlled Trials

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## ABSTRACT

**Aim:** This systematic review and meta-analysis aimed to answer the following focused question: Are rotary file systems more effective than hand file systems in terms of the quality of obturation and instrumentation time among primary teeth?

**Study eligibility criteria, participants, and interventions:** The inclusion criteria comprised studies that compared the effect on quality of obturation and instrumentation time among primary teeth after using rotary and hand file systems for biomechanical preparation of the root canals.

**Materials and methods:** This review was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. The searched databases included Medline (via PubMed), EBSCO, and Google Scholar. Articles published from January 2000 to December 2021, but only in English, were included.

**Results:** The search resulted in 8,003 published studies. After the removal of duplicate studies and full-text analysis, 9 studies were selected for systematic review, and 8 were selected for meta-analysis. Overall, the results demonstrated the promising effects of rotary file systems in reducing instrumentation time and improving obturation quality compared to hand files.

**Conclusion:** Within the limitations of this review, it can be asserted that rotary file systems are superior to hand files in primary teeth for pulpectomy procedures.

**Clinical significance:** Rotary files, a more recent technique, are more efficient than traditional hand files in lowering the time required for instrumentation. Additionally, they provide superior obturation quality in primary molars, making them particularly beneficial for pediatric patients.

**Keywords:** Hand files, Instrumentation time, Pedo rotary files, Quality of obturation, Systematic review.

*International Journal of Clinical Pediatric Dentistry* (2024): 10.5005/jp-journals-10005-2950

## INTRODUCTION

Despite the myriad of developments in dentistry, dental caries remains a predominant oral health issue afflicting humanity. Dental caries is a multifaceted condition characterized by the degradation of the tooth's hard tissue. It is regulated by four key factors: the tooth structure, saliva composition, microbial presence, and dietary habits.<sup>1</sup> The bacterial fermentation of dietary carbohydrates, specifically lactic acid, leads to a fall in pH. This decrease in pH promotes demineralization of the hard tissue in the tooth structure, resulting in the loss of minerals. This loss of minerals leads to the formation of cavities, discomfort, pain, and ultimately, tooth loss.<sup>2</sup> Bacteria, particularly *Mutans streptococci* and *lactobacilli*, are principally responsible for producing these organic acids. These bacteria have the ability to live on the surface of the tooth.<sup>3</sup> The decayed area affecting the innermost part of the tooth, known as the dental pulp, necessitates the performance of a pulpectomy. Therefore, pulpectomy should be regarded the preferred method for treating diseased primary teeth, despite its demanding and time-consuming nature in the field of pediatric dentistry. This surgery is performed with the aim of preserving the primary tooth inside the dental arch.<sup>4</sup> The primary objective of this technique is to eliminate all the irritated dental pulp and debris within the dentin, resulting in a smooth and gradually

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**How to cite this article:** Gala UP, Kalaskar R, Vinay V, et al. Comparative Evaluation of Effectiveness of Rotary and Hand File Systems in Terms of Quality of Obturation and Instrumentation Time among Primary Teeth: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *Int J Clin Pediatr Dent* 2024;17(8):962–969.

**Source of support:** Nil

**Conflict of interest:** Dr Ritesh Kalaskar is associated as the National Editorial Board member of this journal and this manuscript was subjected to this journal's standard review procedures, with this peer review handled independently of this editorial board member and his research group.

narrowing preparation. This will enable effective disinfection and the implantation of filling materials. The efficacy of this approach is heavily contingent upon the child's level of cooperation, which is closely correlated with the duration of the session.<sup>5</sup>

Various instruments are available to remove the inflamed pulp. These endodontic files are broadly divided into hand files and rotary files depending on their mechanism of operation.<sup>6</sup> The rotary files provide an edge over hand files as they have superior cleaning and shaping of the canal space.<sup>4,5</sup> However, there is a need to compare the effectiveness of these new instruments with the traditionally used hand files.

Therefore, in line with the research inquiry, “Does the use of rotary and hand file systems result in differences in the quality of obturation and the extent of periodontal engagement during root canal treatment in primary teeth?”

## MATERIALS AND METHODS

A comprehensive examination of the existing literature was conducted, followed by a meta-analysis. This study adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 guidelines. The study followed the principles outlined in the Cochrane Handbook for Systematic Reviews of Interventions, version 5.1.0, and the 4th edition of the JBI Reviewer’s Manual. Furthermore, it was officially recorded at PROSPERO with the registration code CRD42022340810.

### Search Strategy

The review used population, intervention, comparison, outcome, study design (PICOS) inclusion criteria to select studies. Two independent reviewers evaluated titles and abstracts to find eligible articles. A third reviewer examined all inquiries. Root canal therapy was performed utilizing rotary filing equipment in the intervention group and manual/hand files in the comparison group. To find documents published until December 2021, Medline (via PubMed), EBSCO, and Google Scholar were searched. Only English-language publications were searched. Medical Subject Headings (MeSH) phrases and text words were used to combine widely cited descriptions from earlier publications on this topic to create the electronic search strategy. Each database included pedo rotary files, hand files, obturation quality, instrumentation time, and systematic review. Combining phrases with “AND” and “OR” created the search technique. The search algorithms specified for each database are outlined in Table 1.

### Eligibility Criteria

Included in the analysis were studies that assessed the efficacy of rotary and hand file methods in terms of the quality of obturation

and the time taken for instrumentation in primary teeth. The qualifying criteria were determined according to the PICOS method outlined in the PRISMA-2019 guidelines as follows.

Population: Research including individuals who have undergone primary tooth intervention.

Intervention: Studies involving root canal treatment done using rotary file systems like Kedo-S files, K3 files, etc.

Comparison: Studies involving root canal treatment done using manual/hand files—K files or H files, hand ProTaper files.

Outcome:

- Studies providing information about the quality of obturation: underfill, optimal fill, overfill among the groups.
- Studies providing information about mean instrumentation time among the groups.

Study design: Randomized clinical trials.

### Selection of Studies

The authors of this study independently chose the selected studies by thoroughly reviewing the titles and abstracts. The complete content was accessible when it was unfeasible to assess the research solely relying on the title and abstract. In the second phase, a comprehensive analysis of all the texts was conducted, and the studies were evaluated for inclusion based on the eligibility criteria utilizing the PICOS technique. Discrepancies about the inclusion of studies were handled by reaching a consensus with a third author. Only the studies that were identified in the database search were included once, without any repetition.

### Data Extraction

After selecting the eight publications from the entire collection of databases, two reviewers separately gathered data from the included research. Disputes were once again settled via deliberation. Data collection was conducted utilizing a checklist of items selected for the purpose of extracting data.

All relevant information, such as publication and study details, participant information, settings, interventions, comparators, outcome measures, study design, statistical analysis, results, and other pertinent data (such as funding and conflict of interest), was meticulously and precisely extracted from all the included studies. The process of data extraction was carried out meticulously, and the results were precisely documented in separate Excel sheets for each of the major outcomes.

### Critical Appraisal of Retrieved Studies

The papers were qualitatively analyzed using the Cochrane risk of bias tool, specifically the Bias Risk Assessment of Randomized Controlled Papers as outlined in the Cochrane Handbook.

### Meta-analysis

The evaluation of measures for continuous data entailed computing the average instrumentation time and standard deviations for all groups. A descriptive synthesis was performed to analyze and combine the data, offering a detailed account of the specific attributes of each study that was incorporated. To conduct a quantitative synthesis, the cumulative estimate of the intervention’s impact was calculated by averaging the differences in the observed effects across various studies following the intervention. The I<sup>2</sup> heterogeneity was assessed and interpreted to establish the appropriate application of the effect model, whether it should be a fixed or random effect model. The data integration process was performed using the program Review Manager 5.3.

**Table 1:** Search strategy in the database

Database	Search strategy	Findings
PubMed	#1 (((rotary[All Fields] AND files[All Fields]) AND (“hand”[mesh Terms] OR “hand”[All Fields]) AND files[All Fields])) AND (quality[All Fields] AND obturation[All Fields])) AND (“tooth, deciduous”[mesh Terms] OR (“tooth”[All Fields] AND “deciduous”[All Fields]) OR “deciduous tooth”[All Fields] OR (“primary”[All Fields] AND “teeth”[All Fields]) OR “primary teeth”[All Fields])) AND (“randomized controlled trial”[All Fields] OR “randomized controlled trials as topic”[mesh Terms] OR “randomized controlled trials”[All Fields] OR “randomised controlled trials”[All Fields])	5,079
Google Scholar	Pedo Rotary files Hand files Quality of obturation Instrumentation time	2,924

**RESULTS**

The initially proposed computerized database scan on PubMed/MEDLINE, Cochrane Library, and DOAJ resulted in a total of 8,003 titles. A grand total of 638 articles were recognized as duplicates. After assessing the abstracts, two individual reviewers identified 254 titles that were relevant to the subject area. In addition, 7,111 titles were excluded because they were not pertinent to the matter at hand and did not meet the necessary timeframe for publication. Following meticulous study and extensive discussion among the reviewers, a total of 19 publications were selected for a comprehensive evaluation of their complete text. No further publications were identified by a thorough manual analysis of the reference lists of the chosen research. After the initial screening process, application of specific criteria for inclusion and exclusion,

and addressing the PICO questions, a total of 9 publications were selected for inclusion in the qualitative synthesis and subsequently underwent data extraction. A meta-analysis was conducted on a combined total of 8 publications.

**Study Characteristics**

Qualitative synthesis was conducted on nine selected papers, and their general characteristics are outlined in Table 2. All of the studies considered in the analysis were randomized controlled clinical trials. Eight of the studies were conducted in India. A total of 495 youngsters with primary molars and primary anterior teeth were included in the study. The findings of all the tests indicate that rotary filing systems demonstrate decreased instrumentation time and superior obturation quality in comparison to hand filing systems (Table 3). The Cochrane Risk of Bias instrument (ROB-2) was

**Table 2:** Characteristics of the included studies

Sr. no.	Study ID	Country	Study design	Sample size	Age (years)	Intervention group	Control group	Follow-up	Outcome assessed	Conclusion
1.	Vieyra 2014 <sup>16</sup>	Mexico	RCT	45 primary molars	4–7	Rotary Light Speed LSX instruments n = 15	Manual K files n = 15	6, 12, 18, 24 months	Instrumentation time, success	Utilizing rotary files in primary teeth offers numerous benefits compared to manual K files: (1) efficiency in both preparation time and root canal form; (2) the conical form of the root canal, which improves the quality of the root canal filling and enhances clinical success
2.	Govindraju 2017 <sup>15</sup>	India	RCT	45 primary molars	4–8	K3 rotary system n = 15	Manual K files n = 15	–	Instrumentation time, success	The hand files, S2 ProTaper Universal, and K3 0.25 tip 4% taper file systems exhibited comparable performance in terms of obturation quality. There was a notable disparity in the time it took to perform instrumentation using manual techniques compared to using modified rotary file systems in primary teeth
3.	Govindraju 2018 <sup>25</sup>	India	RCT	45 anterior teeth	4–6	K3 rotary system n = 15	Manual K files n = 15	–	Instrumentation time, obturation quality, pain	Utilizing the Kedo-S rotary file for canal preparation leads to a reduction in the amount of time required for instrumentation and also diminishes the severity of pain experienced. The obturation quality of the primary anterior canals with the Kedo-S pediatric rotary file is comparable to that achieved with hand files and the ProTaper rotary system
4.	Panchal 2019 <sup>19</sup>	India	RCT	75 primary molars	4–7	Kedo-S rotary files	Hand K-file	–	Instrumentation time, obturation quality	The Rotary Kedo-S files provide superior obturation quality compared to the K-file and H-file instrumentation techniques, particularly with a greater proportion of ideal obturation outcomes. The time required for instrumentation using Rotary Kedo-S files was much shorter compared to the time required for instrumentation using K-file and H-file

Contd...



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Sr. No.	Study ID	Country	Study design	Sample size	Age (years)	Intervention group	Control group	Follow-up	Outcome assessed	Conclusion
5.	Priyadarshini 2021 <sup>22</sup>	India	RCT	45 primary molars	6-9	Kedo-SG Blue n = 15	Manual K files n = 15	1 week	Instrumentation time, pain perception	Pediatric rotary files (Kedo-SG Blue) were found to result in reduced postoperative discomfort. Efficient filling leads to reduced postoperative pain
6.	Pawar 2021 <sup>21</sup>	India	RCT	75 primary molars	4-9	Kedo-S n = 25	Manual K files n = 25	-	Instrumentation time, obturation quality	Utilizing adaptive XP-endo Shaper instrumentation led to expedited instrumentation and superior obturation quality compared to pediatric rotary files and manual instrumentation
7.	Preethy 2021 <sup>23</sup>	India	RCT	45 primary molars	4-6	Kedo-SG Blue n = 15	Manual K files n = 15	-	Instrumentation time, obturation quality	Rotary files yield superior obturation quality compared to the manual instrumentation approach. The use of rotary files in deciduous molars also results in a reduction of instrumentation time during pulpectomy surgery
8.	Shah 2021 <sup>20</sup>	India	RCT	45 primary molars	5-9	Kedo-S files n = 15	Manual K files n = 15	-	Instrumentation time, obturation quality	Utilizing pediatric rotary files for instrumentation, while ensuring total isolation with a rubber dam, enhances the quality of obturation and improves clinical outcomes. The Pro-AF files demonstrated the highest count of ideal fillings with the fewest instances of empty spaces, followed by the Kedo-S rotary files
9.	Tyagi 2021 <sup>24</sup>	India	RCT	75 primary molars	4-8	Pediatric rotary files n = 15	Hand K-flex files n = 15	1 week	Instrumentation time, pain, child behavior	Rotary files, including both pediatric and reciprocating ones, have the advantage of shorter instrumentation and obturation time compared to manual files

**Table 3:** Data extraction sheet

Study ID	Instrumentation time (in minutes)			Obturation quality		
	Group I	Group II	Group III	Optimal	Underfilled	Overfilled
Vieyra 2014 <sup>16</sup>	20.10 ± 7.86	9.37 ± 2.19	10.45 ± 4.77	29	5	11
Govindraju 2017 <sup>15</sup>	95.47 ± 12.7	45.93 ± 10.07	64.73 ± 16.2	26	5	14
Govindraju 2018 <sup>25</sup>	41.93 ± 10.49	19.6 ± 9.3	14.8 ± 4.1	15	18	12
Panchal 2019 <sup>19</sup>	12.8 ± 0.85	13.3 ± 0.53	9.38 ± 0.77	35	9	31
Priyadarshini 2021 <sup>22</sup>	-	-	-	2.2	48.9	48.9
Pawar 2021 <sup>21</sup>	10.9 ± 0.7	14.8 ± 1.2	19.9 ± 1.0	46	13	16
Preethy 2021 <sup>23</sup>	5.21 ± 14.51	2.09 ± 23.35	1.53 ± 16.37	-	-	-
Shah 2021 <sup>20</sup>	27.87 ± 1.35	19.25 ± 2.98	21.89 ± 2.43	-	-	-
Tyagi 2021 <sup>24</sup>	40.02 ± 7.08	27.40 ± 6.27	25.26 ± 7.86	-	-	-

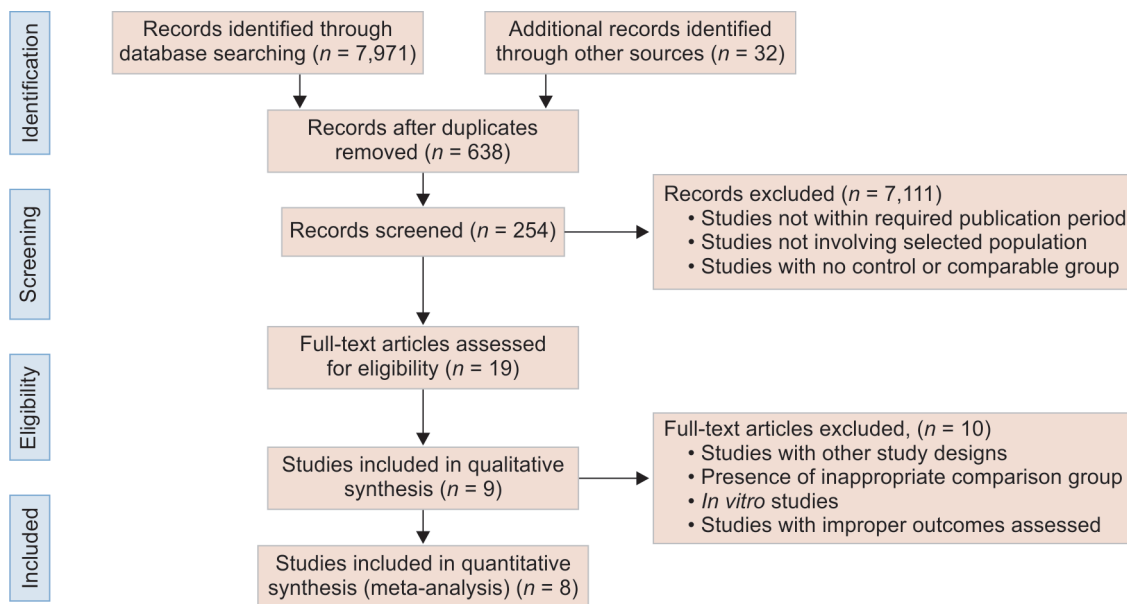
employed to evaluate the quality of randomized controlled trials. The information can be found in Table 4. Three studies showed a low risk of bias, five studies demonstrated a moderate risk, and one study demonstrated a high risk of bias (Figs 1 to 3). The study done by Shah et al. did not provide information regarding randomization, allocation, and blinding, resulting in a high-risk score of 7. Most of the research did not meet the requirement of blinding participants and personnel.

**Meta-analysis**

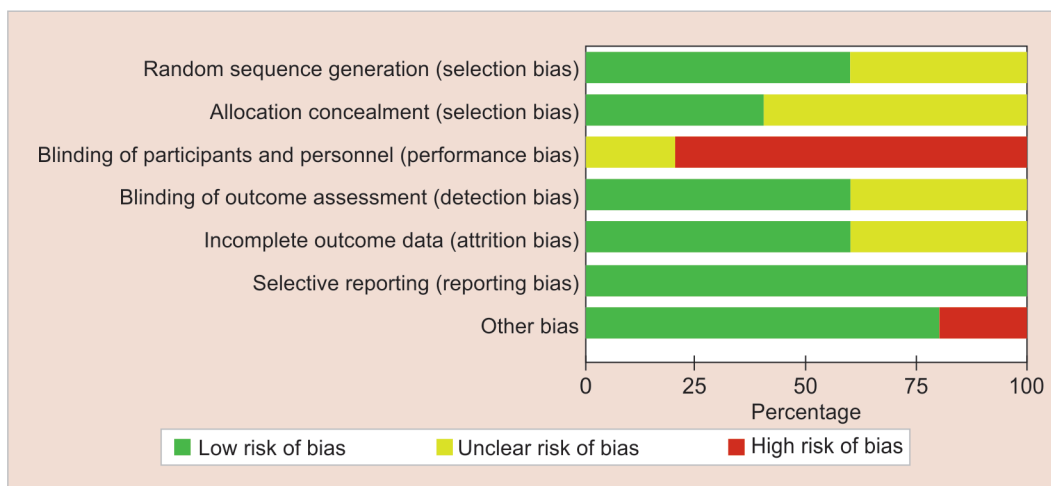
The meta-analysis comprised eight studies. The I<sup>2</sup> statistic was employed to measure the heterogeneity or inconsistency among the research. The interpretation was conducted in accordance with the guidelines outlined in the Cochrane Handbook for Systematic Reviews of Interventions. Since the I<sup>2</sup> value exceeded 50%, the random effects model was utilized. Effect sizes are numerical measures that indicate the direction and extent of

**Table 4:** Quality of assessment of the included studies

Sr. no.	Study ID	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias	Risk of bias
1	Vieyra 2014 <sup>16</sup>	Unclear	No	Yes	Unclear	Yes	Unclear	Unclear	Moderate risk
2	Govindraju 2017 <sup>15</sup>	Yes	Yes	Unclear	Unclear	No	Yes	No	Moderate risk
3	Govindraju 2018 <sup>25</sup>	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Low risk
4	Panchal 2019 <sup>19</sup>	Yes	Yes	Yes	Yes	No	Yes	Unclear	Moderate risk
5	Priyadarshini 2021 <sup>22</sup>	Yes	Yes	Yes	Unclear	Yes	No	Yes	Low risk
6	Pawar 2021 <sup>21</sup>	Unclear	Unclear	Unclear	No	No	Yes	Yes	Moderate risk
7	Preethy 2021 <sup>23</sup>	Yes	Unclear	Yes	Yes	Unclear	Yes	Unclear	Moderate risk
8	Shah 2021 <sup>20</sup>	No	No	Unclear	Unclear	Yes	Unclear	Unclear	High risk
9	Tyagi 2021 <sup>24</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Low risk



**Fig. 1:** Preferred Reporting Items for Systematic Reviews and Meta-Analysis study flow diagram



**Fig. 2:** Risk of bias graph

the impact of treatments on outcomes. Effect sizes for variations in continuous data (mean) were calculated using the mean response, standard deviation, and the total number of individuals in each group.

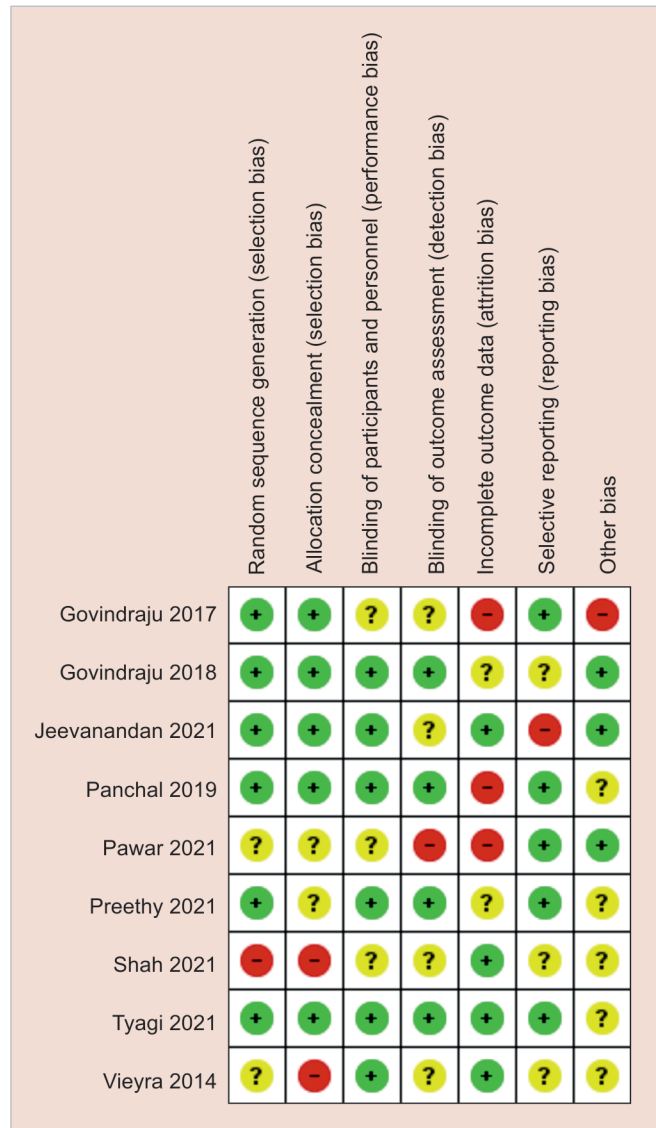


Fig. 3: Risk of bias summary

### Mean Instrumentation Time

Eight studies were included for evaluating the pooled estimate of instrumentation time for completing the procedure. The pooled estimate favored the experimental group [-10.37 (-12.97, -7.77)], suggesting that the instrumentation time required with pedo rotary files is less compared to the manual filing system (Fig. 4) ( $p < 0.05$ ).

### DISCUSSION

This systematic review and meta-analysis aim to evaluate the effectiveness of the rotary instrumentation technique compared to the manual instrumentation strategy in achieving successful root canal therapy in primary teeth, with a specific focus on the time taken for instrumentation and the quality of obturation. Chugh et al. have undertaken a similar systematic review. Research conducted in 2021 examined both systems and revealed that rotary instrumentation led to a significant reduction in the time needed for instrumentation. This finding is substantiated by data of intermediate quality.<sup>7</sup> The ultimate effectiveness of endodontic therapy relies heavily on the thorough cleansing, shaping, and subsequent complete filling of the intricate root canal system.<sup>8,9</sup> The endodontic system, consisting of the root canal spaces, can be readily reached using both manual and rotary files.

Traditionally, canals have been shaped with manually operated devices manufactured from 0.02 tapered stainless steel that adhere to ISO standards.<sup>10</sup> While reamers and files are both available as instruments, most reports recommend utilizing files. K-type files and reamers are highly efficient in both linear and rotational filing actions, while the Hedstrom file should only be used for filing purposes.<sup>3,4</sup> Excessive cutting is noted on the exterior wall in the uppermost part, causing the formation of cracks and irregularities. Furthermore, on the inner wall, there is a tendency for excessive cutting to occur more toward the crown, especially at the start of the curve. This is because stainless steel files larger than #15 or #20 lose their flexibility and have a tendency to become straight.<sup>11</sup> Another disadvantage is that 0.02 taper hand instruments have a tendency to create narrow canal forms, which restrict the availability of irrigants and increase the risk of pushing debris toward the apex. Various preparation techniques were devised to overcome the limitations of these devices, aiming to minimize iatrogenic anomalies and achieve canals with a more expanded shape.<sup>10,12</sup>

The utilization of Ni-Ti marked a significant turning point in the field of endodontics, enabling the development and manufacturing of innovative manual and rotary instruments with superior attributes compared to stainless-steel instruments.

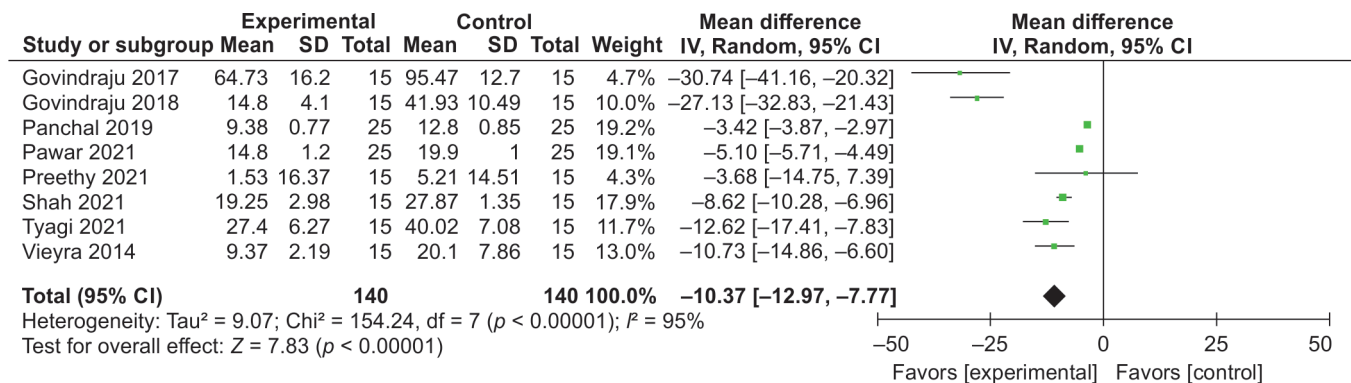


Fig. 4: Forest plot for mean instrumentation time

As a result, this led to treatments that were more efficient and reliable.<sup>9,13</sup> Ni-Ti exhibits two primary attributes: shape memory and superelasticity (or pseudoelasticity), but the former trait is not utilized in endodontics. The alloy's ability to flex and adapt to the geometry of the canal is facilitated by its superelasticity, also known as pseudoelasticity, which explains its significant advantages.<sup>14</sup> This enables the rotation and manipulation of the canal while maintaining a centered position, even in the presence of pronounced curves. This diminishes the restorative power and its adverse consequences (such as punctures, obstructions, and removal) on the initial path of the canal, which is characteristic of steel instruments.<sup>9</sup>

Multiple clinical experiments have been conducted on primary teeth to demonstrate the efficacy of rotary files in terms of reducing instrumentation time. Nevertheless, there is a contradiction observed in the literature regarding the evaluation of obturation quality following the cleaning and shaping of canals using manual and rotary filing systems. In a study conducted by Panchal et al., the term "overfilling" was used to describe the situation when obturation extended beyond the apex, while "underfilling" referred to the condition when obturation fell short of the radiographic apex by 2 mm. An obturation located precisely at or within 1 mm of the radiographic apex was deemed optimal. In a distinct clinical trial performed by Govindaraju et al., the adequacy of obturation was evaluated by classifying it as underfill, optimal fill, or overfill based on radiographic imaging.<sup>15</sup> This indicates a deficiency in the available evidence that evaluates the result of obturation using a consistent standard. Therefore, this systematic review was conducted with the purpose of addressing this gap in the existing literature.

A clinical research study conducted by Vieyra in 2014 involved the selection of 45 teeth. These teeth were separated into three groups, each using different instruments: hand K files, hand Protaper, and rotary Light Speed LSX instruments. The statistical analysis revealed a significant difference in the instrumentation times required across the three groups ( $p < 0.001$ ).<sup>16</sup> Ochoa-Romero et al. found that K3 rotary files and manual instrumentation resulted in 80, 50, and optimal filling, respectively.<sup>17</sup> Govindaraju et al. conducted comparable tests to assess the efficacy of obturation. They utilized an altered iteration of the criteria established by Coll and Sadrian. The results showed that 67% of cases had ideal filling when K3 rotary files were used, whereas Protaper rotary files and manual instrumentation achieved optimal filling in 60% and 53% of cases, respectively.<sup>15,18</sup> There were no notable distinctions among the three groups in terms of the quality of obturation. The use of the K3 rotary file system resulted in a statistically significant decrease in the time required for primary root canal instrumentation.<sup>15</sup> This finding contradicts the study conducted by Ochoa-Romero et al., which reported that rotary files yielded better obturation quality in primary teeth. The problematic outcome may be ascribed to the use of diverse materials and methodologies for obturation.<sup>15,17</sup>

Panchal et al. conducted a clinical experiment where 75 primary molars were evenly divided for instrumentation using K-file, H-files rotational, and Kedo-S files. The study's results indicated that pediatric rotary files manufactured by Kedo-S exhibit greater obturation quality and require less instrumentation time, resulting in increased overall compliance of pediatric patients.<sup>19</sup> Several recent studies have examined the use of adaptable instrumentation for performing pulpectomy procedures on primary molars. These investigations have focused on the notable benefits of reduced instrumentation time and improved obturation.<sup>20-24</sup>

The selected studies were evaluated for quality using the Risk of Bias (ROB-2) technique, which is designed for clinical and randomized controlled trials. Randomization was a criterion for this assessment, with the goal of ensuring that each participant had an equitable opportunity to receive any of the therapies being tested in the experiment. The reporting of random sequence creation was satisfactory in six investigations, but the research conducted by Vieyra and Pawar et al.<sup>16,21</sup> had ambiguous random sequence generation. Performance bias, a component of quality evaluation, can be mitigated by the use of suitable blinding. Out of all the studies included, six studies successfully implemented blinding of participants in their trials.<sup>16,19,22-25</sup> Five studies<sup>15,19,22,24,25</sup> also reported allocation concealment. Thus, when conducting a comprehensive evaluation of bias possibility in every single relevant research, it was noted that the clinical study conducted by Shah et al.<sup>20</sup> had a substantial risk of bias. Three experiments were done to compare the rotating Kedo-S filing systems with manual K files. The findings revealed that the use of Kedo-S files resulted in better quality of obturation, with a higher frequency of perfect obturation outcomes compared to the K-file and H-file instrumentation techniques.<sup>19-21</sup> The instrumentation time using rotary Kedo-S files was significantly shorter compared to the instrumentation time using K-file and H-file.<sup>19-21</sup> The Kedo-SG pediatric rotary files offer a gradual taper, effectively preventing excessive instrumentation of the inner walls of the root surface and preserving the native structure of root canals.<sup>22</sup> Only two studies have utilized this filing system and conducted a comparison with conventional files. Observations indicated that the use of rotary files resulted in reduced postoperative pain. This can be attributed to the fact that achieving optimal filling with these files leads to a decrease in postoperative discomfort.<sup>22,23</sup>

Primary teeth possess roots that are shorter, thinner, and more curved, while their dentin is comparatively softer and less thick than that of permanent teeth. The assimilation of the root apex is frequently indiscernible. The root canal system displays a morphology resembling a ribbon.<sup>17</sup> The presence of rotational devices rotating around the root canals of primary teeth might lead to the accumulation of unclean patches and potentially unhealthy tissue on the fins and isthmuses. Thus, when managing ribbon-shaped canals, it is essential to utilize an H-file (Nos. 25 or 30) employing a brushing technique together with sufficient sodium hypochlorite irrigation. This process ensures the complete removal of any loose pulp tissue and a thorough cleaning and preparation of all root canals to be filled.<sup>17,18</sup> The disadvantages of Ni-Ti rotary systems encompass their elevated price and the need for training to achieve proficiency in the technology. Proficiency in operating rotary equipment is crucial for the operator to efficiently control the working length, as there is a reduction in tactile sensitivity when performing apical preparation with rotary tools compared to manual mechanical preparation.<sup>21,22</sup>

One of the strengths of the study is that the systematic review was conducted in accordance with the PRISMA criteria. A comprehensive search methodology was utilized. This review employs a quantitative synthesis that integrates data from several research investigations, leading to more precise outcome parameters compared to a single study. This methodology successfully detected the differences among clinical studies. In addition, it measured the amount of time spent on instrumentation by using meta-analysis.

## Constraints

A limited selection of databases was utilized for this review. Another constraint of the current analysis is its inclusion of only studies documented in English. The inclusion of research conducted in languages other than English is unlikely to significantly impact the summary treatment effects of combined estimates. This systematic review encompassed a limited number of clinical trials, resulting in increased heterogeneity. The meta-analysis lacked the capacity to measure or assess the quality of obturation.

## CONCLUSION

Pediatric dentists can utilize the data from the present systematic review to make informed decisions on the efficacy of manual and rotary equipment in carrying out pulpectomy procedures on primary teeth. Randomized controlled trials comparing hand and rotary instrumentation have shown a substantial decrease in instrumentation time (10.37 minutes) when utilizing rotary instrumentation. A substantial majority of those who used rotary instruments achieved a remarkable level of obturation fill quality. Pediatric dentists are recommended to utilize rotary instruments for biomechanical preparation due to their superior efficiency in root canal preparation compared to manual instrumentation.

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