

# Awareness of Evidence Based Recommendations on Toothbrush Bristles Design and Texture among Dentists

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## Abstract:

**Objective:** Dental plaque is a necessary etiologic factor in the onset and progression of dental caries and periodontal disorders. Numerous individual and material-based factors have an impact on dental plaque control. In light of the most recent evidence-based guidelines, this study's purpose is to determine the best toothbrush bristles surface plane design (flat; multilevel; angled), texture (soft; medium; hard) and to estimate how many dentists are aware of that too. **Materials and Methods:** This is a one-question survey directed on social media platforms of dentists' groups: - "Is it preferable to use a toothbrush with soft or medium bristles, and are toothbrushes with multi-level or angled bristles better than traditional flat bristles for brushing the teeth?". The answers or reactions were limited to the first valid 400 answers. **Results:** Comparing the bristles texture (soft & medium) and bristles design (straight & multilevel or angled) showed a statistically significant difference ( $p \leq 0.05$ ). Also, there was a statistically significant difference between combining effects taking this descending order soft & multilevel, medium & straight, medium & multilevel and finally soft & straight. **Conclusions:** Premium toothbrushes based on scientific research with soft, multilevel, or angled bristles were used more frequently by dentists than ones with medium or straight bristles.

## Introduction:

Dental plaque is a necessary etiologic factor in the onset and progression of dental caries and periodontal disorders.<sup>1,2</sup> Loe et al.<sup>1</sup> demonstrated that plaque removal can reverse the progression of gingivitis. As a result, good plaque reduction is essential for better dental health.<sup>3</sup>

Controlling dental plaque is affected by a variety of individual and material-based factors such as individual dexterity, toothbrushing technique, frequency and duration in addition to the design of the toothbrush.<sup>4</sup>

The technological advancement in the toothbrush morphological appearance (handle, head and bristles), compensates for improper toothbrushing technique and time.<sup>5,6</sup> Toothbrush design has seen a lot of creativity and innovation, and there are currently a lot of manual toothbrushes on the market. There is, however, insufficient evidence supporting that one toothbrush design is superior to another.<sup>7,8</sup>

There are a variety of toothbrush head designs to choose from.<sup>9</sup> Toothbrush selection is typically a matter of personal preference rather than a demonstrated proficiency of one type over another.<sup>10</sup> During toothbrushing, the majority of people lower plaque scores by almost 50%.<sup>7</sup> According to one systematic review, toothbrushes with multi-level or angled bristles remove plaque more effectively than those with flat-trimmed bristles.<sup>11</sup>

Although medium-bristled toothbrushes have been demonstrated to be efficient in removing biofilm, the American Dental Association (ADA), recommends soft-bristled toothbrushes with gentle pressure because they reduce the risk of gingival injury and recession.<sup>12,13</sup>

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Most of our attitudes are based on previous knowledge and authority. Therefore, the purpose of this study is to assess on scientific evidence, the best toothbrush bristles surface plane design (flat; multilevel; angled), texture (soft; medium; hard) and to estimate how many dentists are aware of that too.

## Materials and Methods:

This is a one-question survey directed on social media platforms of dentists' groups "Is it preferable to use a toothbrush with soft or medium bristles, and are toothbrushes with multi-level or angled bristles better than traditional flat bristles for brushing the teeth?".

The answers or reactions were limited to the first 400 answers as they reproduce a confidence level of 95% and 5% margins of error of the measured value) [according to calculated sample size using Raosoft Sample Size Calculator (<http://www.raosoft.com/samplesize.html>)]. Taking into considerations that all irrelevant answers were excluded.

This study was conducted after approval of the Ethical Committee of the Faculty of Dentistry, under this code number [A05100522].

A group of dentists was selected so that we could link their answers to the extent of their knowledge based on the evidence with all recent recommendations of the most reliable and high-quality research from some institutions such as the American Dental Association (ADA).

The Statistical Package of Social Science (SPSS) software for Windows was used to conduct the statistical analysis (Standard version 24). To represent qualitative data, we used numbers and percentages. The goodness of fit and association between categorical variables were investigated using the Chi-square test of significance. The results were considered significant when ( $p \leq 0.05$ ). The larger the significance of the results, the lower the p-value attained.

**Results:**

First valid four hundred responses from dentists were recorded. Comparing the bristles texture (soft & medium) and bristles surface plane design (straight & multilevel or angled) was shown in, (Table 1 and both Figures 1 & 2). A statistically significant difference was determined related to toothbrushes with soft bristles (63%), in addition to those with multilevel or angled bristles (76.5%).

The association between different toothbrush designs and textures was registered in, (Table 2 and Figure 3). There was a statistically significant difference between combining effects taking this descending order soft & multilevel (97.6%), medium & straight (59.5%), medium & multilevel (40.5%) and finally soft & straight (2.4%).

Table 1: Frequency of using different toothbrush designs and textures

Variables		Total no. (%)	Frequency no. (%)	(Chi-square test for goodness of fit) + P-value
Bristles texture	Soft	400 (100%)	252 (63%)	27.040 (0.000)
	Medium		148 (37%)	
Bristles surface plane design	Straight	400 (100%)	94 (23.5%)	112.360 (0.000)
	Multilevel or angled		306 (76.5%)	

P value ≤ 0 .05 level, no. (%) = number (percentage)

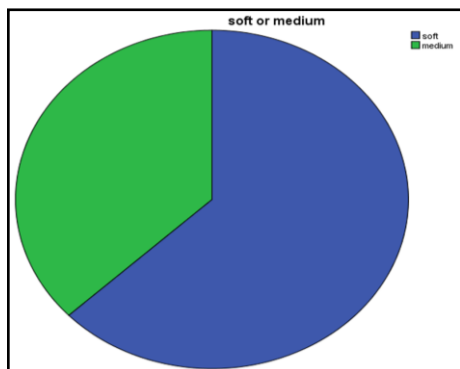


Figure 1: Frequency of using different toothbrush bristles surface plane designs

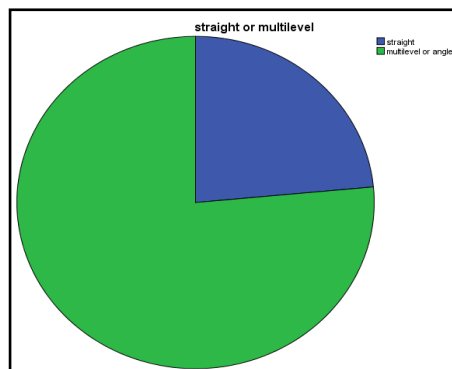


Figure 2: Frequency of using different toothbrush bristles textures

Table 2: Association between different toothbrush designs and textures

Variables		Straight no. (%)	Multilevel or angled no. (%)	(Chi-square test for association) + P-value
Bristles surface plane design				
Bristles texture	Soft	6 (2.4%)	246 (97.6%)	168.973 (0.000)
	Medium	88 (59.5%)	60 (40.5%)	

P value ≤ 0 .05 level, no. (%) = number (percentage)

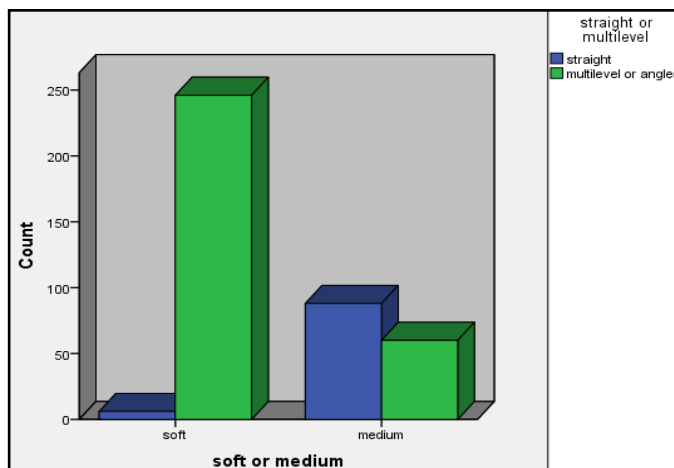


Figure 3: Association between different toothbrush designs and textures

## Discussion:

The results of this study showed that soft-bristle and multilevel or angled toothbrushes were used more frequently than medium and straight plane one. This reflects direct or even indirect awareness of furthest dentists with the most suitable tooth brush for the following reasons.

Hamza et al.<sup>14</sup> speculated that soft-bristle toothbrush generate little abrasion than the medium-bristle toothbrush with increased force of brushing. In comparison to the soft-bristle toothbrush, the hard-bristle one pulled more abrasive particles beneath the end of the bristle, resulting in increased abrasive wear.<sup>15</sup>

Soft-bristle toothbrushes, on the other hand, showed a different response to brushing force than harder-bristle toothbrushes since they were far deflected by the high brushing force and therefore pulled lesser abrasives over the surface of the teeth than medium bristles. It's also possible that the deflected bristles caught additional abrasive particles inside themselves, acting as a barrier between them and the tooth surface.<sup>14</sup>

The amount of force used during brushing might affect the amount of abrasive dentine wear or non-carious cervical lesions that develop. Increased applied brushing forces were shown to be directly related to higher abrasive dentine wear.<sup>16</sup>

However, it might be claimed that patients do not always brush with the same force, and that they may occasionally brush with a higher force to reimburse for a reduced time of brushing or to achieve a 'better' scrubbing on a specific set of teeth. As a result, the soft-bristle toothbrush may be a safer option here than the medium-bristle toothbrush, as it causes less abrasive wear as brushing force increases.<sup>14</sup>

Langa et al.<sup>17</sup> conducted a systematic review and meta-analysis to see how effective different toothbrush bristle stiffness and end-shapes are at reducing interproximal plaque scores and gingival inflammation. They concluded that when it comes to interproximal surfaces, soft tapered-tip bristle toothbrushes may produce superior outcomes in those who don't utilize interproximal cleaning products. Even though medium and hard bristle toothbrushes have a superior impact, more negative occurrences, such as gingival lesions, are predicted. Even without the use of any interdental cleaning technology, toothbrushes with soft tapered-tip bristles showed a significant ability to reduce interproximal plaque scores. Because flossing is not widely practiced and frequently conducted ineffectively, the ability to reach interproximal regions with a toothbrush is extremely desirable.

Ranzan et al.<sup>18</sup> conducted a systematic review and concluded that soft and extra-soft bristle toothbrushes tend to be safer on soft tissues. According to studies, the stiffer the toothbrush, the greater the plaque removal effectiveness. Nonetheless, using a medium or

hard toothbrush has been related to negative effects on the oral soft tissue.<sup>12,19,20</sup>

When compared to the standard flat trim, a multilevel bristle tuft arrangement provides better effectiveness. The 'blocking effect' of tight bristle tufts, which prevents individual tufts from reaching interproximal regions, has been a central problem with traditional flat-trim toothbrushes. During brushing, multilevel toothbrushes with alternating rows of tall and shorter bristle tufts act independently, unaffected by surrounding bristles. The longer bristles may efficiently reach deeper between the teeth once independent motion is established.<sup>21</sup>

Kakar et al.<sup>22</sup> evaluate the relative efficacy of commercially available manual toothbrushes to improve periodontal health. A manual toothbrush with angled, criss-cross bristles has been shown to offer significant benefits relative to other toothbrushes. A systematic review by Slot et al.<sup>11</sup> showed that when comparing the multilevel and bilevel arrangements, the angled bristle manual toothbrush had the highest numerical mean plaque reduction. It has also been demonstrated to promote periodontal health in patients receiving fixed orthodontic treatment.<sup>23</sup> In addition, when compared to a manual toothbrush with a typical flat-trim design and ordinary non-tapered bristles, a manual toothbrush with a criss-cross design and tapered bristles exhibited a statistically significant better gingivitis reduction when used twice daily.<sup>24</sup>

Most of the participants' comments about not choosing the medium and flat surfaced toothbrush were confined to the following points: tooth abrasion; gingival recession; didn't go in depth of pits & fissures; ineffective for interproximal cleaning and couldn't be used with orthodontic patients. Plus, most of them didn't know a clear differentiation between angled and multilevel bristled toothbrushes.

The strong points of this study could be summarized in: it is a focused study that answer a specific question; gives direct information based on a controlled sample; summarize the information of most of the previous researches in a simplified way; in addition to saving time and effort.

While the following drawbacks can be identified: this type of study needs a precise formulation of the question, and any misunderstanding of it may lead to incorrect results; the need for a larger study in which some other factors related to the behavior of the individual in using the toothbrush, such as age and gender could be detected; better to ask the questions directly because the use of social media platforms in questions is occasionally inaccurate.

## Conclusions:

Optimum toothbrushes based on scientific research were soft with multilevel or an angled bristle. They were used more frequently by dentists than ones with

medium or straight bristles because of their side effects as tooth abrasion, gingival recession and ineffective interproximal cleaning.

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