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**Comparison of The Effectiveness of Autobrush (U-shaped toothbrush) Versus Manual
Regular Toothbrush Among Children Aged From 9-12 Years**

The study was discussed with the parents and participants after confirming the patient's eligibility, and the parents were asked to give their agreement. Demographic information from the participants was recorded and added to an Excel sheet. When the participants entered the clinics, they were asked to sit on the chair, and the brush to be used was placed in front of the patient according to the table of randomization, assigning the participant to the intervention group. Participants were instructed to avoid all kinds of oral cleaning procedures, including chewing gum, approximately 12 hours before their appointments. Text message reminders were sent the day before the appointment to remind them to stop all oral hygiene measures. To assess the Full Mouth Plaque Score, a disclosing tablet from (Produits Dentaires SA) was crushed using a sterile Porcelain Mortar to turn it into powder. The powder was then stored in a plastic jar and mixed with distilled water to create a disclosing solution. Regarding the randomization, 60 interventions were assigned: 30 participants were assigned to the manual regular toothbrush (Bamboo World Official, China), and the other 30 participants were assigned to the Autobrush (U-shaped toothbrush) (Manual bundle with double-sided nylon brush head U-shaped fits 9-12 Years, San Diego, California). Disposable paper cups were used by the first examiner to prepare two cups for each patient. In each cup, 1 measuring spoon of disclosing powder was added to 10 ml of distilled water using a measured plastic syringe, and the mixture was stirred together. Participants were asked to swish the solution for 30 seconds using a timer and then spit it out without rinsing. The first examiner then counted the stained teeth surfaces using the Full Mouth Plaque Score (FMPS) on 6 sites for each tooth, and the total number of teeth was recorded in the Excel sheet. Next, the second examiner taught each participant the right

brushing technique based on the randomly selected toothbrush. A model and the assigned toothbrush were used for demonstration, and participants were instructed to brush twice a day. The following protocols were used for the brushing technique:

First: Manual regular toothbrush (R):

The Modified Bass Technique for the mixed dentition was used:

1. The toothbrush was placed at a 45-degree angle to the gum line.
2. Each tooth was brushed using a gentle circular movement.
3. The toothbrush was flicked down the tooth, away from the gum line.
4. The brushing sequence started from the buccal surface of Q1, Q2, Q3, and then Q4. Afterward, the lingual surface was brushed starting from Q4, Q3, Q2, and back to Q1.
5. Brushing the occlusal surface for the upper and then the lower.

The entire brushing time was 2 minutes, which was monitored using a timer in front of the participant.

Second: Autobrush U-shaped Toothbrush (U):

1- Put the brush inside the mouth, and bite on it slightly to be sure that all your teeth are inside it.

2- Sway left to right, be sure that the brush reached the maximum left and right for 2 minutes using a timer in front of the participant.

Every participant in the group was instructed to brush their teeth under supervision, without using toothpaste or rinsing with water. After brushing, the participant received the second cup of disclosing solution from the second examiner, who instructed them to swish for 30 seconds while timing themselves and then spit it out without washing. Subsequently, the initial examiner returned to the clinic to conduct a second FMPS examination, which was then documented on an Excel sheet. One of the examiners used fluoridated toothpaste and a regular toothbrush to clean the participant's discolored teeth of the pink stain before allowing them to leave. Finally, the participant was presented with the assigned toothbrush as a gift.

Statistical Analysis

Data was analyzed using descriptive statistics: means, standard deviations, medians, minima, and maxima for continuous variables, and proportions and counts were displayed for categorical variables. The normality of the data was assessed with the Shapiro-Wilk test. The assumption of normality was unmet, the data was not normally distributed. The Mann-Whitney U test was used to compare the overall cleaning effectiveness of the U-shaped toothbrushes and the regular toothbrushes. The same test was also used for specific

comparisons between anterior and posterior teeth, upper and lower teeth, and buccal and lingual surfaces. Statistical significance was set at $P < 0.05$. All analyses were performed using Stata/IC version 16.1 (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC).