

## EFFECT OF HONEY BEE'S PRODUCT (PROPOLIS) MOUTH RINSE IN INHIBITION OF PLAQUE ACCUMULATION AND IMPROVEMENT OF GINGIVAL HEALTH

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### KEYWORDS

Propolis, mouth wash, dental plaque

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### ABSTRACT

**Introduction:** Propolis is a naturally-occurring bee product. It is a hard resinous substance consisting chiefly of wax and plant extracts. It plays a role in the bee colony as protection against invasion and infection, and increases the immunity of bees.

**Aim:** This study was designed to investigate the effectiveness of propolis- mouth rinse in decreasing plaque accumulation and improvement of gingival health in pediatric patients with fixed orthodontic appliances.

**Methods:** This study included 60 children attending orthodontic out patient Orthodontic Department. Faculty of Dentistry, Suez Canal University and assigned into two groups according to different treatment modalities. Propolis mouth wash, group and distilled water group. Mouth wash used twice daily after meals after taking informed consent from parent of each treated child. Plaque index and gingival index periodontal index SM count and LB count were assessed at base line and at a 30-days interval for 3 months. All subjects were instructed to rinse twice daily. Tooth brushing without tooth paste and mouth rinsing.

**Results:** Propolis mouth wash 5% improved gingival health this characteristic of propolis extract was confirmed in our study where percent change of Streptococcus mutans count, lactobacilli count were increased with lower value than control group. Gingival index, periodontal index was decreased by time in each treated groups with statistically significant difference.

**Conclusions:** Propolis mouth wash 5% have a good role in improvement of gingival health thus can be used in children as a regular home care preventive aid.

### INTRODUCTION

Dental plaque is a soft, non- mineralized, microbial biofilm, which develops, accumulates on and adheres to teeth, restorations and prosthetic appliances in the mouth. Dental plaque is composed of salivary glycoproteins, bacteria (cocci, bacilli and filamentous forms) and their metabolic end-products arranged in matrix of extracellular material Clinically, thick layers of dental plaque appear as yellowish or grey deposits which can be only removed mechanically <sup>(1)</sup>.

The last stage is the development of complex flora or plaque maturation where the early supra gingival plaque changes from simple gram-positive coccal bacteria to a complex flora with gram-positive and

gram-negative rods and spirochetes. The presence of gram-positive bacteria enhances the colonisation of other species such as the gram-negative rods by co-aggregation. Plaque reaches the mature stage after 7 to 14 days and becomes relatively stable around the 21st day<sup>(2)</sup>.

The causes and risks of gingival diseases are as varied in children as in adults and range from local to systemic causes. The most important local predisposing factor in children is poor oral hygiene<sup>(3)</sup>.

It has been reported that fixed and removable orthodontic appliances, brackets and bands frequently cause gingival infection thereby complicate oral hygiene and cause inflammation, bleeding, gingival enlargement and increase in pocket depth<sup>(4)</sup>.

Propolis vary widely due to climate, season, location and year, and its chemical formula is not stable. The most important pharmacologically active constituents in propolis are flavonoids (flavones, flavonols, flavonones) phenolics, and aromatics. Flavonoids are well-known plant compounds that have antioxidant, antibacterial, antifungal, antiviral, and anti-inflammatory properties<sup>(5)</sup>. It has medical and dental uses especially anti-bacterial, antibiotic, anti-inflammatory, anti-fungal, anti-viral and antioxidant properties. Topical application of Propolis mouth wash twice daily reduce the incidence of dental caries, it has a great potential against the bacteria related with dental caries such as *S. mutans*. Using a mouth wash of propolis ethanolic extract reduce plaque formation, reduce bacteria in the mouth, relieve dental pain and gum inflammation<sup>(6)</sup>. This study was designed to investigate the effectiveness of propolis- mouth rinse in decreasing plaque accumulation and improvement of gingival health in pediatric patients with fixed orthodontic appliances.

## PATIENTS AND METHODS

**Study setting:** This study included Sixty children from those attending orthodontic outpatient clinic. Faculty of Dentistry, Suez Canal University.

### Inclusion criteria

1. Patients were apparently healthy free from any systemic diseases.
2. Caries free.
3. Age from 12-14 years old.
4. Children had fixed orthodontic appliances more than one month.

### Exclusion criteria:

1. Topical Fluoride (name) application.
2. Gingival inflammation during the treatment.
3. Patient with Antibiotic therapy.

**Grouping:** The 60 Patients were divided into two groups

**Group a: propolis 5%** mouth wash group consist of 40 children received a propolis mouth rinse, and tooth brushing only.

**Group b: control** group consist of 20 children received distilled water and tooth brushing only.

### Clinical procedure:

All subjects were instructed to rinse twice daily for. Tooth brushing without tooth paste and mouth rinsing.

Mouth wash applied twice daily after meals after taking informed consent from parent of the child.

### **Bacteriological examination:**

#### ***On the first visit (before mouth wash):***

1. Each child was instructed not to eat nor drink at least one hour before collecting the samples.
2. Each child was instructed to wash then spit in a sterile plastic wide mouth test tube at least one milliliter of saliva.
3. Saliva samples were used to detect *Streptococcus mutans* and *Lactobacilli* counts

### **Assessment**

Children were evaluated by recording the Plaque Index, the GI, the Periodontal Index scores, and a saliva sample was taken for bacteriological evaluation of the SM and LB count. Plaque index, Gingival index, Periodontal index, and bacteriological assessment of SM count and LB count were done for each child at the first visit (before mouth wash), and after finishing the treatment, 1 month, 2 Months, and 3months.

### **Clinical examination:**

Four areas, distal, facial or buccal, mesial, and lingual, were examined. Specific group of teeth were examined and scored (which are maxillary right-first premolar, maxillary left-central incisor, maxillary left bicuspid, mandibular left-first premolar, mandibular right-central incisor and mandibular right-first bicuspid). Each tooth was dried with cotton and air and examined visually using a mirror, a periodontal explorer with:

1. The plaque index (PI) <sup>(7)</sup>
2. Gingival index (GI) <sup>(8)</sup>
3. Periodontal index <sup>(9)</sup>

### **Bacteriological examination:**

Each child was instructed not to eat nor drink at least one hour before collecting the samples. Children were seated comfortably on the dental chair. Unstimulated saliva was collected by expectorating in a sterile disposable wide mouth test tube over 10 minutes. For standardization of the saliva collection technique the children did not perform any physical exercise before collection (Patil et al., 2010 (10)). Saliva samples were used to detect *Streptococcus mutans* and *Lactobacilli* counts.

### **Culturing the media:**

Each sample was diluted to 1:100; 1:1000; 1:10000 were done using sterile PBS (phosphate buffering solution). Counting plates, with covers divided into equal squares each 1 cm<sup>2</sup>, were used for manual counting of the colony forming units of bacteria. The plates of MSB agar were incubated anaerobically and MRS agar were incubated anaerobically using Oxoid gas pack anaerobic system at 37c for 40-48 hours. The number of colony forming units (CFU/ml) of *Streptococcus mutans* group and *lactobacilli* group were counted. If the dilutions resulted in countable colonies, the sum of them was divided by 3.

## **RESULTS**

The lowest value of the mean plaque index in the third month of follow up in both groups. group a and group b. There was a statistically significance difference between the effect of propolis mouth wash and control group on plaque index. As regard change by time within each group, propolis mouth wash group and control group showed that there was a statistically significant decrease on mean change in plaque index during the follow- up period. Two groups showed significant difference in all values

before and after treatment .but in propolis mouth wash group the values were lower than control group (fig 1).

There was no statistically significant difference between the two groups at baseline as regard Gingival index which was represented as mean and standard deviation values (fig 2). During the follow up periods Streptococcus mutans and Lactobacilli were increased by time in both groups with significant difference but with lower values in propolis mouth wash group (fig 3). there was no statistically significant difference between the two groups at baseline as regard Streptococcus Mutans count which was represented as mean and standard deviation value(fig 3).

A statistically significant decrease in the mean value of *Lactobacilli* count after treatment in the first visit, and showed that there was statistically significant increase on mean change in *Lactobacilli* count during the follow up period with lower value in propolis mouth wash group (fig 4). At the end of three months of experimental period:- A statistically significant difference was noted between groups in Streptococcus mutans and Lactobacilli count of the study groups. The present study was done to examine the effect of bee propolis on Plaque Index ,Gingival Index, Periodontal Index , Salivary Streptococcus mutans count, Lactobacillus count On Orthodontic patients.

**Table (1)** Comparison between the mean plaque index scores in propolis and control groups.

Plaque index		Groups						T-Test	
		Propolis group			Control group			T	P-value
Before mouth wash	Range	1.42	-	1.5	1.4	-	1.5	1.896	0.063
	Mean ±SD	1.493	±	0.017	1.483	±	0.027		
First day after mouth wash	Range	1.42	-	1.5	1.4	-	1.5	1.896	0.063
	Mean ±SD	1.493	±	0.017	1.483	±	0.027		
After 1 Months	Range	1.1	-	1.2	1.25	-	1.3	-11.371	<0.001*
	Mean ±SD	1.173	±	0.045	1.293	±	0.018		
After 2 Months	Range	0.8	-	1	1	-	1.1	-14.537	<0.001*
	Mean ±SD	0.853	±	0.055	1.065	±	0.049		
After 3 Months	Range	0.5	-	0.8	0.7	-	0.8	-9.553	<0.001*
	Mean ±SD	0.683	±	0.050	0.795	±	0.022		
B mw-A1	Differences	Mean ±SD		0.327 ± 0.045		0.208 ± 0.018		<0.001*	<0.001*
	Paired Test	P-value		<0.001*					
B mw-A2	Differences	Mean ±SD		0.648 ± 0.055		0.435 ± 0.049		<0.001*	<0.001*
	Paired Test	P-value		<0.001*					
B mw-A3	Differences	Mean ±SD		0.818 ± 0.050		0.705 ± 0.022		<0.001*	<0.001*
	Paired Test	P-value		<0.001*					

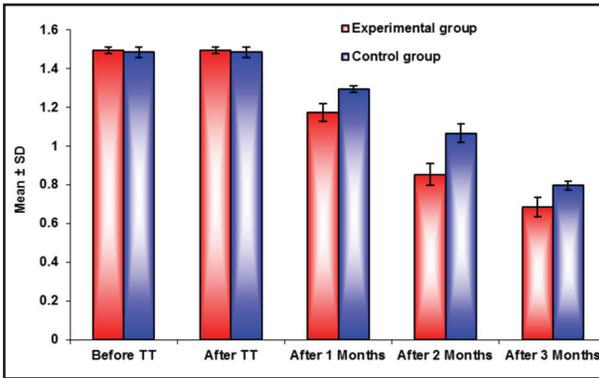


Fig. (1) Bar chart representing mean Plaque index scores in propolis and control groups.

The results in table (1) and figure (1) show that there was no statistically significant difference between the two groups at baseline as regard plaque index which was represented as mean and standard deviation values. In Propolis group at the base line mean and SD was  $1.493 \pm 0.017$  and at 1 month  $1.173 \pm 0.045$ , and at 2 months was  $0.853 \pm 0.055$  and at 3 months of follow up was  $0.683 \pm 0.050$ . with significance difference. In control group at the base line mean and SD was  $1.483 \pm 0.027$  and at 1 month  $1.293 \pm 0.018$ , and at 2 months was  $1.065 \pm 0.049$  and at 3 months of follow up was  $0.795 \pm 0.022$  with significant difference.

During the follow up period there was decrease in the plaque index with significant difference. with lowest value in the 3 month of follow up in both groups. There was a statistically significant difference between the effect of propolis mouth wash and control group on plaque index. As regard percent change by time within each group, Propolis group and Control group show that there was a statistically significant decrease on mean change in plaque index. During the follow- up period.

Figure (2) show that the lowest value of the mean plaque index in the third month of follow up in both groups. group 1 and group 2. There was a statistically significance difference between the

effect of propolis mouth wash and control group on plaque index . As regard percent change by time within each group , propolis mouth wash group and control group showed that there was a statistically significant decrease on mean change in plaque index during the follow- up period.

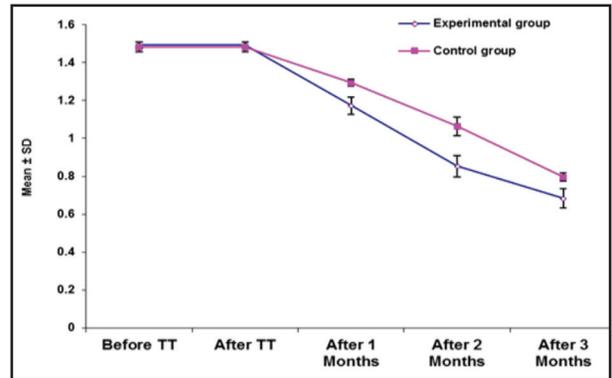


Fig. (2) Linear chart representing mean Plaque index scores in propolis and control groups.

The results in table (2) and figure (3) show that there was no statistically significant difference between the two groups at baseline as regard Gingival index which was represented as mean and standard deviation values.

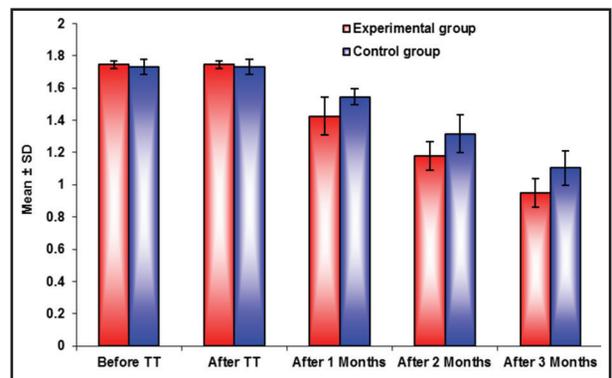


Fig. (3) Bar chart representing mean Gingival index scores in propolis and control groups.

In Propolis group at the base line mean and SD was  $1.745 \pm 0.022$  and at 1 month  $1.426 \pm 0.117$ , and at 2 months was  $1.179 \pm 0.089$  and at 3 months

of follow up was  $0.948 \pm 0.088$ . with significant difference.

In control group at the base line mean and SD was  $1.730 \pm 0.047$  and at 1 month  $1.545 \pm 0.051$ , and at 2 months was  $1.315 \pm 0.117$  and at 3 months of follow up was  $1.103 \pm 0.108$ . with significant difference.

During the follow up period there was improvement in the gingival condition with significant difference. As regard percent change by time within each group, groups 1 and 2 showed that there was a statistically significant decrease on mean change in Gingival index during the follow-up period.

Figure (4) show that the lowest value of the mean gingival index in the third month of follow up in both groups propolis mouth wash group 1 and group 2. There was a statistically significance difference between the effect of propolis mouth

wash and control group on gingival index. As regard percent change by time within each group, propolis mouth wash group and control group showed that there was a statistically significant decrease on mean change in plaque index during the follow-up period.

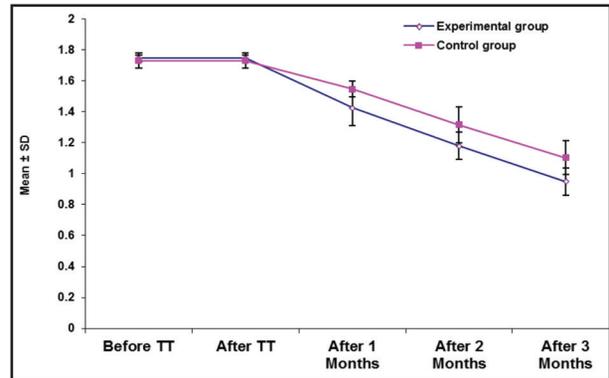


Fig. (4) Linear chart representing mean Gingival index scores in propolis and control groups.

**Table (2): Comparison between the mean Periodontal index scores in propolis and control groups.**

Periodontal index			Groups				T-Test	
			Propolis group		Control group		T	P-value
Before mouth wash	Range	0.8 - 0.9	0.8 - 0.8	1.009	0.317			
	Mean ±SD	0.805 ± 0.022	0.800 ± 0.000					
First day after mouthwash	Range	0.8 - 0.9	0.8 - 0.8	1.009	0.317			
	Mean ±SD	0.805 ± 0.022	0.800 ± 0.000					
After 1 Months	Range	0.5 - 0.7	0.6 - 0.7	-9.901	<0.001*			
	Mean ±SD	0.605 ± 0.032	0.690 ± 0.031					
After 2 Months	Range	0.3 - 0.6	0.5 - 0.6	-18.760	<0.001*			
	Mean ±SD	0.408 ± 0.042	0.595 ± 0.022					
After 3 Months	Range	0.2 - 0.5	0.4 - 0.5	-19.654	<0.001*			
	Mean ±SD	0.218 ± 0.055	0.485 ± 0.037					
B mw-A1	Differences Paired Test	Mean ±SD	0.200 ± 0.023	0.110 ± 0.031				
	P-value	<0.001*	<0.001*					
B mw-A2	Differences Paired Test	Mean ±SD	0.398 ± 0.036	0.205 ± 0.022				
	P-value	<0.001*	<0.001*					
B mw-A3	Differences Paired Test	Mean ±SD	0.588 ± 0.052	0.315 ± 0.037				
	P-value	<0.001*	<0.001*					

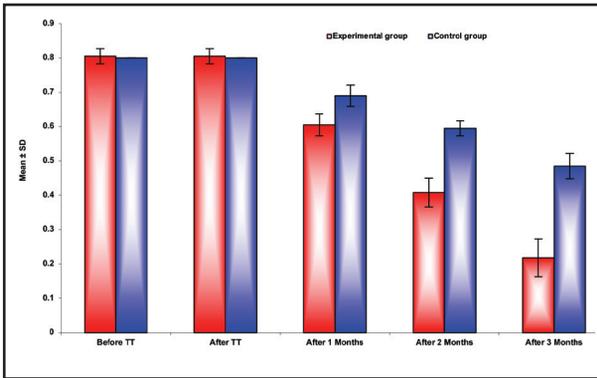


Fig. (5) Bar chart representing mean periodontal index scores in propolis and control groups.

Most of children show gingivitis and periodontitis with russel periodontal index before treatment .Then the propolis and control groups show improvement in the periodontal condition after treatment..

In Propolis group at the base line mean and SD was  $0.805 \pm 0.022$  and at 1 month  $0.605 \pm 0.032$ , and at 2 months was  $0.408 \pm 0.042$  and at 3 months of follow up was  $0.218 \pm 0.055$ . with significant difference.

In Control group at the base line mean and SD was  $0.800 \pm 0$  and at 1 month  $0.690 \pm 0.031$  ,and at 2 months was  $0.595 \pm 0.022$  and at 3 months of follow up was  $0.485 \pm 0.037$ . with significance difference. During the follow up period there was changes in the periodontal condition with significance difference. The results in table (3) and figure 59) showed that there was no statistically significant difference between the two groups at base line as regard Periodontal index which was represented as mean and standard deviation values.

As regard percent change by time within each group, groupe 1 and 2 showed that there was a statistically significant decrease on mean change in Periodontal index during the follow- up period.

Figure (6) show that that the lowest value of the mean periodontal index in the third month of follow up in both groups propolis mouth wash group 1 and group 2. There was a statistically significance difference between the effect of propolis mouth wash and control group on periodontal index. As regard percent change by time within each group, propolis mouth wash group and control group showed that there was a statistically significant decrease on mean change in plaque index during the follow- up period.

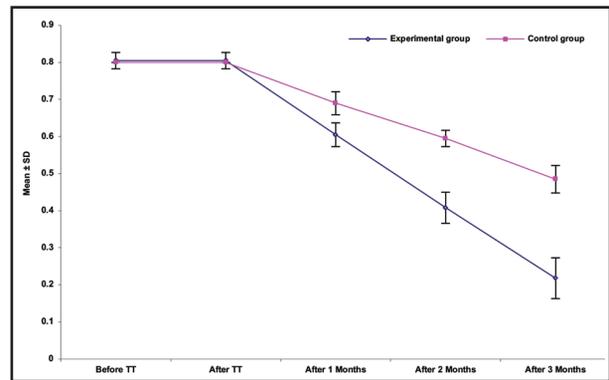


Fig. (6) Linear chart representing mean periodontal index scores in propolis and control groups.

The results in table (4) and figure (7) show that there was no statistically significant difference between the two groups at baseline as regard Streptococcus Mutans count which was represented as mean and standard deviation value.

In Propolis group the mean Streptococcus mutans count in CFU at base line was  $386.250 \pm 7.906$  and then the count decrease after using mouth wash of propolis in the first visit .Then the count decrease by time at 1 month Mean ± Sd was  $320.250 \pm 8.00$  and in 2 month the lactobacilli count increase Mean ±SD was  $411.375 \pm 3.993$  .at 3months Mean ±SD was  $446.000 \pm 4.961$ . with significant difference.

**Table (3)** Comparison between the mean *St mutans* count in CFU in propolis and control groups.

St mutans count			Groups						T-Test	
			Propolis group			Control group			T	P-value
Before mouth wash	Range		360	-	395	370	-	390	1.343	0.185
	Mean ±SD		386.250	±	7.906	383.500	±	6.509		
First day after mouth wash	Range		260	-	310	290	-	340	-12.322	<0.001*
	Mean ±SD		286.375	±	9.870	319.750	±	9.931		
After 1 Months	Range		310	-	340	350	-	380	-22.664	<0.001*
	Mean ±SD		320.250	±	8.002	371.000	±	8.522		
After 2 Months	Range		400	-	415	420	-	435	-18.377	<0.001*
	Mean ±SD		411.375	±	2.993	429.750	±	4.723		
After 3 Months	Range		440	-	450	460	-	490	-13.751	<0.001*
	Mean ±SD		446.000	±	4.961	470.500	±	8.870		
B-A	Differences	Mean ±SD	99.875	±	10.591	63.750	±	9.580		
	Paired Test	P-value	<0.001*			<0.001*				
B mw-A1	Differences	Mean ±SD	66.000	±	11.048	12.500	±	11.976		
	Paired Test	P-value	<0.001*			<0.001*				
B mw-A2	Differences	Mean ±SD	-25.125	±	8.358	-46.250	±	6.463		
	Paired Test	P-value	<0.001*			<0.001*				
B mw-A3	Differences	Mean ±SD	-59.750	±	9.604	-87.000	±	13.898		
	Paired Test	P-value	<0.001*			<0.001*				

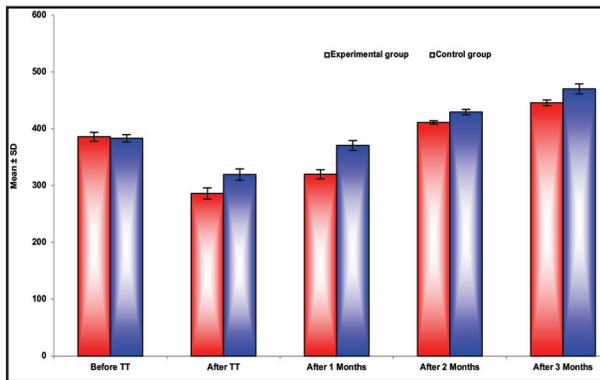


Fig. (7) Bar chart representing mean Streptococcus mutans count in CFU scores in propolis and control groups.

In control group the mean Streptococcus Mutans count in CFU at base line was 383.500±6.509 and then the count decrease after mouth rinsing with water in the first visit .then the count increase in the first month follow up Mean ±SD was 371.00± 8.522 .and in 2 month the Streptococcus Mutans count increase by time Mean ±SD was 429.750 ±4.723.in the 3 month Mean ±SD was 470.500±8.870.

As regard percent change by time within each group, Prpolis group and control group show that there was a statistically significant increase on mean change in Streptococcus Mutans count during the follow- up period.

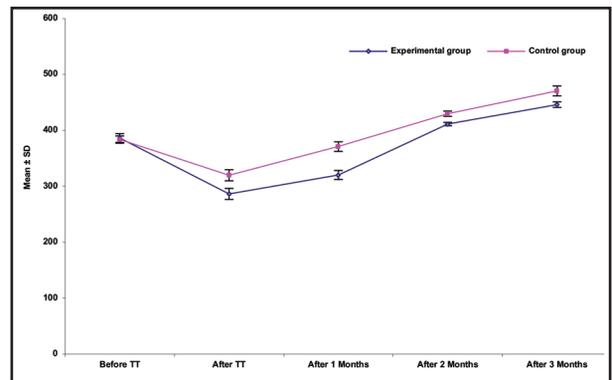


Fig. (8) Linear chart representing mean Streptococcus mutans count in CFU scores in propolis and control groups.

Figure (8) show that a statistically significant decrease in the mean value of Streptococcus count

after treatment in the first visit , and show that there was statistically significant increase on mean change in Streptococcus count during the follow up period with lower value in propolis mouth wash group.

**Table (4) Comparison between the mean Lactobacillus count in CFU in propolis and control groups.**

LB count		Groups				T-Test	
		Propolis group		Control group		T	P-value
Before mouth wash	Range	310	- 320	300	- 320	0.000	1.000
	Mean ±SD	314.000	± 4.830	314.000	± 5.982		
First day after mouth wash	Range	220	- 250	250	- 270	-15.718	<0.001*
	Mean ±SD	236.250	± 6.279	261.000	± 4.472		
After 1 Months	Range	280	- 290	280	- 290	-15.161	<0.001*
	Mean ±SD	259.125	± 7.753	287.000	± 3.770		
After 2 Months	Range	330	- 350	340	- 360	-9.290	<0.001*
	Mean ±SD	341.000	± 3.955	352.500	± 5.501		
After 3 Months	Range	400	- 420	410	- 450	-11.113	<0.001*
	Mean ±SD	410.250	± 7.675	435.500	± 9.445		
B-A	Differences Paired Test	Mean ±SD	77.750 ± 7.922	53.000 ± 9.234			
	P-value		<0.001*	<0.001*			
B mw-A1	Differences Paired Test	Mean ±SD	28.000 ± 7.232	27.000 ± 6.366			
	P-value		<0.001*	<0.001*			
B mw-A2	Differences Paired Test	Mean ±SD	-27.000 ± 6.485	-38.500 ± 7.452			
	P-value		<0.001*	<0.001*			
B mw-A3	Differences Paired Test	Mean ±SD	-96.250 ± 8.752	-121.500 ± 10.894			
	P-value		<0.001*	<0.001*			

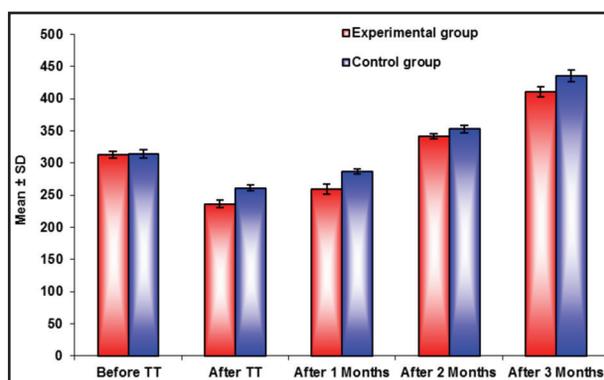


Fig. (9) Bar chart representing mean Lactobacillus count in CFU in propolis and control groups.

The results in table (5) and figure (9) show that there was no statistically significant difference between the two groups at baseline as regard Lactobacillus count in CFU which was represented

as mean and standard deviation value. Base line was In propolis group the mean Lactobacilli count in CFU at 314.00 ± 4.830 and then the count decrease after using mouth wash of propolis in the first visit .Then the count decrease by time at 1 month Mean ± Sd was 236.25± 6.279 and in 2 month the lactobacilli count increase Mean ±SD was 341.00±3.955 .at 3months Mean±SD was 410.250 ±7.675. with significant difference.

In control group the mean Lactobacilli count in CFU at base line was 314.00±5.982 and then the count decrease after mouth rinsing with water in the first visit .then the count decrease in the first month follow up Mean ±SD was 287± 3.770 .and in 2 month the lactobacilli count increase by time Mean ±SD was 352.500 ±5.501 .in the 3 month

Mean  $\pm$ SD was  $435.500 \pm 9.445$ . As regard percent change by time within each group, groups 1 and 2 show that there was a statistically significant increase on mean change in Lactobacilli count during the follow-up period.

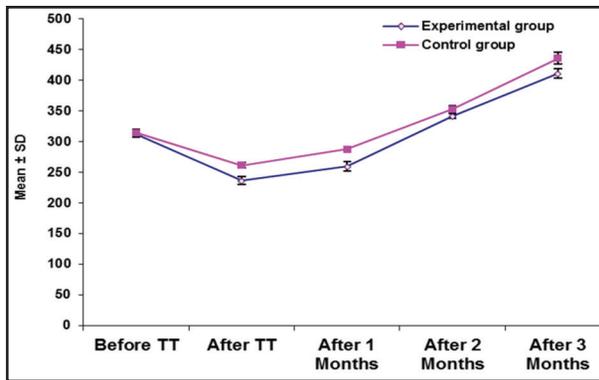


Fig. (10) Linear chart representing mean Lactobacillus count in propolis and control groups.

Figure (10) shows that a statistically significant decrease in the mean value of Lactobacilli count after treatment in the first visit, and showed that there was a statistically significant increase on mean change in Lactobacilli count during the follow-up period with lower values in the propolis mouth wash group.

## DISCUSSION

Daily use of efficient anti-bacterial compounds, especially a formulated form of mouth wash, can be very beneficial in plaque control and improvement of gingival health. Propolis is a naturally-occurring bee product. It is a hard resinous substance consisting chiefly of wax and plant extracts. Propolis extracts have been recognized for their wide range of pharmacological activities, including prevention of oral diseases<sup>(11)</sup>. Propolis has medical and dental uses especially anti-bacterial, antibiotic, anti-inflammatory, anti-fungal, anti-viral and antioxidant properties. This study showed a positive inhibitory

influence of ethanol extract of Polish propolis with respect to the oral micro-organisms growth.

Mitis Salivarius Bacitracin Agar was used to detect and quantify Streptococcus mutans in accordance with Gold et al.<sup>(12)</sup> who stated that the presence of bacitracin in the Mitis Salivarius Bacitracin Agar at critical concentration which tolerated by Streptococcus mutans but not by other oral viridans streptococci makes it a selective media for streptococcus mutans isolation.

Saliva samples were used to determine levels of Streptococcus mutans and Lactobacilli because it was likely to be the most reliable method in children due to higher odds ratio between level of the count in plaque and saliva, as confirmed by Sanchez<sup>(13)</sup>.

In propolis mouth wash group, during the follow-up period the mean count values of Lactobacilli and Streptococcus mutans in CFU increased by time. This agreed with Duailibe et al. 2007<sup>(14)</sup> who showed that an increase in the number of bacteria or no change in 9.5% of the samples of their study respectively after using propolis as an oral rinse for one week, and attributed this result to the quality of resin and its properties<sup>(15)</sup>.

In contrast, Hegde et al.,<sup>(16)</sup> found that propolis extract results in significant reduction in the number of Streptococcus mutans colonies due to the effect of propolis on bacterial growth. These differences in results between investigations might have been influenced by the time of sample collection which is affected by overlapping factors, such as a delayed peak formation of colonies which occur more than 2 hours after the meal consumption.

In the present study, the propolis extract did not result in complete inhibitory effects against Streptococcus mutans and Lactobacilli count but resulted in improvement of gingival health. This characteristic of propolis extract was confirmed in

our study where percent change of *Streptococcus mutans* count, lactobacilli count were increased with lower value than control group, gingival index and periodontal index were decreased by time in each treated groups with statistically significant difference. This agreed with Ting, and Silver. <sup>(17)</sup>, who suggested that using a mouth wash of propolis ethanolic extract reduce plaque formation, relieve dental pain and gum inflammation i.e. Gingivitis & periodontitis. Also agreed with **Koo. et al.** <sup>(6)</sup> who evaluated the effect of a mouth rinse containing propolis on 3-day dental plaque accumulation. The experimental mouth rinse reduced the insoluble polysaccharide concentration in dental plaque by 61.7 % compared to placebo. An experimental mouth rinse containing propolis was thus efficient in reducing supragingival plaque formation and insoluble polysaccharide formation under conditions of high plaque accumulation.

## CONCLUSION

Propolis mouth wash 5% have a good role in improvement of gingival health thus can be used in children as a regular home care preventive aid.

## REFERENCES

1. Loe H, Kleinman DV. Dental Plaque Control Measures and Oral Hygiene Practices. *Quintesse Int* 1996;27(6): 390-395.
2. Chapple I, Gilbert A. Understanding periodontal diseases: Assessment and diagnostic procedures in practice, London, Quintessentials Publishing Co. Ltd, 2002.111-146.
3. Albandar JM. Global risk factors and risk indicators for periodontal diseases. *Periodontol* 2000. 2002;29:177-206.
4. Arikian F, Eronat N, Candan U, Boyacio H. Periodontal conditions associated with space maintainers following two different dental health education techniques. *J Clin Pediat Dent*. 2007;31:229- 234.
5. Bankova V, Boudourova-Krasteva, G, Popov S, Sforcin JM, Funari, SC. Seasonal variations of the chemical composition of Brazilian propolis. *Apidologie* 1998;29: 361-367.
6. Koo H, Cury JA, Rosalen PL, Ambrosano GM, Ikegaki M, Park YK. Effect of a mouthrinse containing selected propolis on 3-day dental plaque accumulation and polysaccharide formation. *Carie Res* 2002 ;36(6): 445-448.
7. Silness J, Loe H. Periodontal disease in Pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 1964;22:121-35
8. Loe H, Silness J. Periodontal disease in pregnancy: Prevalence and Severity. *Acta Odontol Scand* 1963;21:533-51.
9. Ramfjord, S. Indices for prevalence and incidence of periodontal disease *Journal of Periodontology* 1959 ; 30: 51-59.
10. Patil S, Venkataraghavan K, Anantharaj A, Patil S. Comparison of two commercially available toothpastes on the salivary streptococcus mutans count in urban preschool children—an in vivo study. *Group* 2010;1(50):53720.
11. Duarte S, Rosalen PL, Hayacibara MF, et al. The influence of a novel propolis on mutans streptococci biofilms and caries development in rats. *Arch Oral Biol*. 2003;51(1):15-22.
12. Gold OG, Jordon HV, Van Houte J. A selective medium for *Streptococcus niuuns*. *Arch Oral Biol* 1973;18:1357-1364.
13. Sanchez-Pertez and A costa-Gio. caries risk assessment from dental plaque and salivary streptococcus mutans count on two culture media. *Arch Oral Biol* 2001 ;46:49-55.
14. Duailibe SADC, Gonçalves AG, and Ahid FJM. Effect of a propolis extract on *Streptococcus mutans* counts in vivo. *J Appl Oral Sci*. 2007;15(5):420-423.
15. Park YK, Koo MH, Ikegaki M, Cury JA and Rosalen PL. Effects of propolis on *Streptococcus mutans*, *Actinomyces naeslundii*, *Staphylococcus aureus*. *Rev Microbiol* 1998; 29:143-8.
16. Hegde KS, Bhat SS, Rao A, Sain S. Effect of Propolis on *Streptococcus mutans* counts: an in vivo study. *Int J Clin Pediat Dent*. 2013 Jan;6(1):22.
17. Ting PT and Silver S. Allergic contact dermatitis to propolis. *J Drugs Dermatol* 2004 ;3(6):685-686.