Comparative Analysis of Cariogenic Potential of Different Types of Commercially Available Milk Beverages- An Intervventional Study

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Authors’ contributions
This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT
To assess the cariogenic potential of almond milk, soya milk, coconut milk and bovine milk, was evaluated to check ability to enable Streptococcus mutans association formed, acid manufacturing, as well as their ability to buffer pH transforms. The baseline non stimulated whole salivary sample (2.5-5 ml) will be collected from the students in the morning at least 1 hr after breakfast. The salivary samples (pre-test and post-test) will be collected and tested for the CFUs. Salivary samples are transported in a plastic container to the microbiological laboratory. They were then tested for the number of CFUs for S. mutans using mitis salivarius bacitracin agar. Soya milk promoted much more biofilm development, whereas sugar free almond milk promoted a little. When pH test was performed, sugar free almond milk had the lowest cation exchange capacity, whereas bovine milk had the maximum cation exchange capacity.

Keywords: Almond milk; cariogenicity; dental caries; Streptococcus mutans.

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1. INTRODUCTION

Dental decay remains among the most common infectious diseases, and tooth decay levels in preschoolers are rising [1]. Tooth decay - breakdown of tooth surface caused by acidified metabolites of bacterial fermentation of sugars of plaque [2]. It is a disease caused by multiple factors, with primary causes including crucial species of bacteria of the plaque microbiota, saliva fluid & concentration, oral health, and the nature and occurrence of lactose consumption. Consistent ingestion containing sucrose-rich meal of circumstances such as saliva inadequacy may cause ecosystem transformation in the plaque microbiota [3], supposed to lead to overproduction of acidogenic and aciduric organisms, that involves S. mutans. S.mutans is well-known for its capacity to establish strong biofilms on tooth surfaces, to quickly metabolise multiple kinds of sweeteners and relieve acids, and to withstand multiple and recurring environmental issues like pH ph values in plaque [4]. The infectivity of S. mutans is based on its acidogenic and aciduric characteristics, that allow the microorganism to generate acid from carbohydrate fermentation and also stay alive and continue to spread in an acidic conditions.

Optionally Optionly commercially present bovine milk beverages, but at the other hand, have been on the rising trend. This figure is projected to grow to a variety of factors, along with lactose intolerance, slimming foods, hormones, antibiotics, genetic engineering, ethical concerns about animal rights, the success of vegetable diet, and also awareness that milk substitutes substitutes were nutritious compared to cattle-based milk [5]. Some other component is the heightened concern of allergic reactions to bovine-based food items.

Soy milk is high in potassium and can be supplemented with supplements A, B-12, and D, but also calcium. It has the same amount of protein as cow milk and is lower in calories so it contains no saturated fat and is lactose-free by nature. Coconut milk builds muscle and helps reduce fat. Some other benefits are that it assists in weight loss, improves digestion, lowers blood pressure and cholesterol. For all of these reasons, customers consider alternative currently accessible milk beverages such as soy milk, almond milk, coconut milk are favourable substitution for bovine milk.

1.1 Background/Rationale

The result of research will assist us in determining the pathogenic ability of milk drinks that is critical for dentists when counselling patients on nutrition preference and disease prevention procedures.

1.2 Objectives

Estimation of the pathogenic ability of commercially available bovine milk, soya milk, coconut milk on bacterial colonies of salivary S. mutans pathogen.

Comparison of the cariogenic potential of commercially available bovine milk, soya milk and coconut milk on the bacterial colonies of salivary S. mutans pathogen.

3. METHODS

It is an interventional study which will be conducted in Sharad Pawar Dental College, Sawangi, Wardha. The sample for the same consists of 20 participants with DMFT score more than 3 and PI score more than 2. All subjects will be verbally informed and written informed consent will be taken and from all those willing for participation in the study. The following commercially available milk will be used in the study- Bovine milk, almond milk, coconut milk and soya milk. The baseline non stimulated whole salivary sample (2.5-5 ml) will be collected from the students in the morning at least 1 hr after breakfast. They will be instructed not to consume anything (except water) prior to saliva collection to reduce the possibility of food particles and saliva activation. Four different types of milk will be distributed among 20 students and will be advised to rinse the mouth for 1 min using 10 ml of the milk. Rinsing will be carried out under the supervision of the investigator. The salivary samples (pre-test and post-test) will be collected and tested for the CFUs. Salivary samples will be transported in a plastic container to the microbiological laboratory. They were then will be tested for the number of CFUs for S. mutans using mitis salivarius bacitracin agar.

2.1 Inclusion Criteria

1) Patients aged between 18 to 23 years
2) Patients should not be immunocompromised
3) Patients DMFT score should be more than 3
4) Patients PI score should be more than 2

2.2 Exclusion Criteria
1) Patients age below 18 and above 23 years
2) Patients who are immune-compromised
3) Patients DMFT score less than 3 and PI score less than 2.

The participants will be randomly divided into four groups consisting of 4 samples each as follows:

- Group 1: bovine milk
- Group 2: soya milk
- Group 3: almond milk
- Group 4: coconut milk

3. RESULTS

Estimation of the pathogenic ability of commercially available bovine milk, soya milk and coconut milk on the bacterial colonies of salivary S. mutans and comparing its colony to analyse the microbial growth in saliva which will determine the most caries promoting beverage.

4. DISCUSSION

Tooth decay is a disease which is linked to the acidic chemical compounds produced by pathogen in plaque bacterial species [6]. The capacity of a foods and drinks to encourage pathogenic bacteria in the biofilm formation, to yield acids from fermentation of sugar, and to buffer are supervisors used to assess the pathogenic ability of different food and beverage [7]. The pathogenic characteristics of six popular almond milk drinks, as well as cattle based milk and soy milk, were investigated intensively in this research that used pathogenic S. Mutans grown in an in vitro biofilm model that is widely utilized [8]. Our findings shows, out of all the milk drinks tested, Soy milk (SOY) and cow whole milk (COW) accepted much more S.mutans microbial growth. After 24 hours, S. mutans had some of the smallest culture ph values .According with current research by Daspher et al., [Daspher et al., 2012], Soy milk will have the greatest decreases of growth media pH, as evidenced by their theft potential to boost pathogenic microbial growth and its inadequate buffering potential. The above findings imply that soy milk is an extremely cariogenic drink [9].

Once coconut milk is being used, it is understood to have antibacterial activity as well as other medical advantages [10]. Surprisingly, only those coconut milk beverages examined reveal strong evidence for the establishment of S. mutans biofilms. Those coconut milk beverages, apart from for CCA, has inadequate buffering ability which continuously seemed to have the least cultural pH after microbial fermentation. CCA, a coconut and almond dairy mixture, on either side, had the highest buffering potential of the substitute milk beverages tested in this research. Although it produced a significant amount of lactic acid as a result of microbial fermentation, the cultural pH dropped just by a little more than one group, that is distinct from another coconut milk drinks. Its unsure what attributed to the blenders high buffering potential.

The Classic Almond milk drink has been exposed to ex vivo tooth decay modelling approach, together with bovine whole milk (COW) as a regulation that will further analyze the pathogenic ability. Bovine whole milk is said to encourage significant S. mutans cell growth having a powerful buffering ability and some antibacterial elements such like lactoferrin, lysozyme, and peroxide [11-14]. Recurrent susceptibility to bovine whole milk has been shown to potentially cause tooth decay in such an ex vivo tooth decay model, indicating pathogenic ability [15-17].

5. CONCLUSION

The outcomes of S. in vitro mutans biofilm structure has revealed that, like cow entire milk, the more substituted lactose free milk refreshment drinks evaluated, particularly which complemented with sweet, are effectively causes decay, though variations among both labels and kinds appear. Considering this findings and earlier research, Soy milk, almond milk, and coconut milk evidence to confirm the most bacterial biofilms and have a higher chance of severe inconsistent demineralization and decayed lesions. Dentists should take that statement into account when advising patients on eating habits and preventative medicine strategies. Even so, so much research utilizing in vivo caries designs and medical institution studies is required to reach additional firm interpretation about this prospect that substitute milk refreshment drinks to give rise to poorly
balanced demineralization and decayed tooth. Additional research can look into the clinical appearance for customer consumption, intensity, quantity, age, and dentition in decayed lesion example of primary and adult dentition.

CONSENT

All subjects will be verbally informed and written informed consent will be taken and from all those willing for participation in the study

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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