The Potential Effect of Probiotic Lactobacilli Strains and Miswak on the Inhibition of Microbiota of Severe Early Childhood Caries

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Dedicated to

My Father

Who has always inspired and supported me.

My Mother

For her unconditional love and support.

My Sister

Who has always been my loving and caring partner.

All my friends and family

Who have been always there for me.

List of Contents

List of Tables

List of Figures

List of Abbreviations

1. **ECC:** Early childhood caries
2. **S-ECC:** Severe early childhood caries
3. **CF:** Caries free
4. ***Sm:*** Streptococcus Mutans
5. ***Ss:*** Streptococcus Sorbinus
6. ***Lac.*:** Lactobacilli
7. **S.persia:** Salvadore Persia tree
8. **MRS:** de Man, Rogosa and Sharpe culture media
9. **MSB:** Mitis salivarius bacitracin agar culture media
10. **M17:** A culture media for cultivation of streptococci
11. **LP-MRS:** A culture media for cultivation of Bifidobacteria
12. **SES:** Socio economic status
13. **API:** Analytical Profile Index

Introduction

Severe early childhood caries (S-ECC) is a form of dental caries affecting primary teeth of young children, and is a common health problem worldwide.[1] Children with S-ECC have higher risk of developing new carious lesions, diminished ability to eat, and to live a normal healthy life. [2]

Its complex etiology has intrigued research about certain feeding practices, levels of oral hygiene and plaque, active dental problems in parents/caregivers, and certain demographic factors which all apparently contribute to the risk of developing the disease.[3] Identifying the specific risk factors of the disease is crucial in order to reduce the incidence and severity of dental caries in future generations.

Vertical transmission of pathogenic microorganisms including *Streptococcus mutans (Sm)* from the caregiver to the child plays an

important role in caries development.[4] Although *Sm* has been known to be the primary ecological factor of dental caries, differences in the plaque microbiota among children suffering from S-ECC were observed suggesting wide microbial diversity. [5] The isolation of different microbial species in children will allow the discovery of new pathogens responsible for causing the disease.[6]

The required treatment costs and expertise of highly skilled professionals needed to treat the disease, made it necessary to follow a preventive economic approach,[7] such as promoting for traditional inexpensive means of teeth cleaning or the use of antibacterial agents.[8]

Among the natural products used in tooth cleansing, miswak was the first to be used by mankind as early as 5000 BC. Miswak has been reported to impart an essential antibacterial role, particularly on cariogenic bacteria and periodontal pathogens. [9] Yet more research is needed to emphasize its effect on bacteria causing S-ECC.

Introduction

Probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host.[10] Recently, the antibacterial role of probiotics for prevention of oral diseases has been asserted.[11] Among all probiotic bacteria, *Lactobacilli* have been proven to be the most potent. Strains of LAC.*plantarum*, *LAC.paracasei*, *LAC.salivarius*, and *LAC.rhamnosus* expressed both high antimicrobial activity and high tolerance to environmental stress, which suggested their use for promotion of oral health.[12]

Thus the overall goal of the current study was to assess the different risk factors associated with S-ECC to help enhance risk minimization in the community. More specifically, it was designed to identify the most common oral microbiota of children suffering from S-ECC, and evaluate the potential inhibitory effects of three different probiotic *Lactobacilli* strains and miswak on strains identified to predispose to the disease.

Review of Literature

1) Definition of severe early childhood caries

Dental caries in toddlers and pre-school children was described using different names and terminologies including early childhood tooth decay, baby bottle caries, nursing caries, and rampant caries.[4] Nowadays the nomenclature used among dentists and dental researchers is early childhood caries, instead of baby bottle decay to focus the attention on the multifactorial etiology of caries rather than relating it to inappropriate feeding methods only.[13]

According to the American Academy of Pediatric Dentistry (AAPD), early childhood caries (ECC) has been defined as "the presence of 1 or more decayed (non-cavitated or cavitated lesions), missing due to caries, or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. While the term severe early childhood caries (S-ECC) is used to describe any sign of smooth surface caries in children younger than 3 years of age.

From ages 3 through 5, 1 or more cavitated, missing due to caries, or filled smooth surfaces in primary maxillary anterior teeth or a decayed, missing, or filled score of ≥4 (age 3), ≥5 (age 4), or ≥ 6 (age 5) surfaces constitutes S-ECC".[14]

2) Burden of S-ECC for children and parents

S-ECC is highly prevalent and increasing among poor countries [15] Acute pain caused by dental caries has significant multidimensional impacts on children, their families, as well as the surrounding society.[16] Presence of S-ECC entails a higher risk of development of new carious lesions in a child's primary and permanent dentition, increased treatment time and costs, and diminished oral health related quality of life.[17]

Premature loss of primary molars due to ECC can result in loss of arch space and crowding of the permanent teeth thereby requiring orthodontic correction, which is even financially more consuming.[18] Added to this, restoration and/or extraction of carious teeth can be a traumatic experience for very young children.