ORIGINAL ARTICLE

The oral microbiome community variations associated with normal, potentially malignant disorders and malignant lesions of the oral cavity

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Abstract

The human oral microbiome has been known to show strong association with various oral diseases including oral cancer. This study attempts to characterize the community variations between normal, oral potentially malignant disorders (OPMD) and cancer associated microbiota using 16S rDNA sequencing. Swab samples were collected from three groups (normal, OPMD and oral cancer) with nine subjects from each group. Bacteria genomic DNA was isolated in which full length 16S rDNA were amplified and used for cloned library sequencing. 16S rDNA sequences were processed and analysed with MOTHUR. A core oral microbiome was identified consisting of Firmicutes, Proteobacteria, Fusobacteria, Bacteroidetes and Actinobacteria at the phylum level while Streptococcus, Veillonella, Gemella, Granulicatella, Neisseria, Haemophilus, Selenomonas, Fusobacterium, Leptotrichia, Prevotella, Porphyromonas and Lachnospiraceae were detected at the genus level. Firmicutes and Streptococcus were the predominant phylum and genus respectively. Potential oral microbiome memberships unique to normal, OPMD and oral cancer oral cavities were also identified. Analysis of Molecular Variance (AMOVA) showed a significant difference between the normal and the cancer associated oral microbiota but not between the OPMD and the other two groups. However, 2D NMDS showed an overlapping of the OPMD associated oral microbiome between the normal and cancer groups. These findings indicated that oral microbes could be potential biomarkers to distinguish between normal, OPMD and cancer subjects.

Keywords: oral bacteria, oral cancer, Malaysia, 16S cloned library, DGGE

INTRODUCTION

Oral cancer is a subset of head and neck cancer which is a type of cancer that occurs in the oral cavity affecting the lips, tongue, gingiva, floor of mouth, palate and other related structures (International Classification of Diseases 10th edition codes C00-06).1,2

Globally, it was estimated to be the 15th most common cancer with higher incidences among males in 2012.3 The estimated incidence and death from oral cancer saw a global increment of 14.2% and 13.9% respectively from 2008 to 2012.4 Two-thirds of the cases occurred in developing countries and it is a major persistent health issue in parts of South Central Asia and South East Asia, where it was estimated to be one of five most common cancer between 2008 and 2012.5,6 In parts of these regions, oral cancer was shown to comprise up to 40% of all cancer cases.6 In high risks countries such as Papua New Guinea, Pakistan, Maldives, Sri Lanka and India, it was one of the three most common cancers.7

In Malaysia, oral cancer is the third most common head and neck cancer, affecting the elderly population and with equal risk for both genders. It is most common among Indians