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Correlation of Low CD4+ Counts with High Dental Caries Prevalence in Children Living with Perinatal HIV/AIDS Undergoing Antiretroviral Therapy

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Abstract

Objective: To investigate the correlation Cluster of Differentiation 4⁺ (CD4⁺) counts with a high prevalence of dental caries in Children Living with Perinatal Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (CLWPHA). **Material and Methods:** An analytical observational research with a cross-sectional design was conducted at Tertiary General Hospital, Surabaya, Indonesia. Randomized total sampling consisted of 29 CLWPHA 1-12 years old at outpatient ward Infectious Disease Intermediate Unit (UPIPI) Tertiary General Hospital Doctor Soetomo Surabaya. Demographic details and recent CD4⁺ counts obtained from medical records. Decayed, missing, filled teeth (dmft) in primary teeth and DMFT in permanent teeth index were used. Pearson's and Spearman's Correlation test ($p < 0.05$) were performed. **Results:** Dental caries prevalence was 86.2%; meanwhile, the dmft/DMFT index score found were high (8.2 / 6.3). CD4⁺ count and caries showed significant correlation ($r = -0.394$, $p < 0.05$). Tooth brushing frequency with caries showed a significant correlation ($r = -0.419$, $p < 0.05$). Antiretroviral (ARV) therapy and caries showed an insignificant negative correlation ($p < 0.05$). **Conclusion:** The high prevalence of dental caries in CLWPHA correlated with low CD4⁺ counts.

Keywords: Acquired Immunodeficiency Syndrome; Anti-Retroviral Agents; Dental Caries.

Introduction

About 4.8000 new ¹⁷ Human Immunodeficiency Virus (HIV) infection cases and 38.000 ¹⁷ Acquired Immunodeficiency Syndrome (AIDS) related death cases were found in Indonesia, 2016 [1,2]. The prevalence of People Living with HIV/AIDS (PLWHA) was 620.000, but among them, only 13% were accessing antiretroviral therapy, and 14% was pregnant women living with HIV/AIDS (PWLWHA) were accessing Anti-retroviral (ARV) prophylaxis treatment for HIV/AIDS transmission to their children. An estimated 3200 (2500 - 4000) ²⁰ children were newly infected with HIV due to ²⁰ Mother-To-Child Transmission (MTCT) in Indonesia. In 2017, HIV/AIDS MTCT transmission decreasing in the Asia Pacific, but it's still comparatively high about 17%. Estimated only half of PWLWHA 56% from 61.000 who gave birth in the Asia Pacific region got effective ARV prophylaxis. In addition, only 25% of HIV-exposed infants received early diagnosis [3-7]. The number of Children Living with Perinatal HIV/AIDS (CLWPHA) have greatly increased with more than 230% increase since 2010 [3,7].

Prevalence of dental caries in Children Living with Perinatal HIV/AIDS (CLWPHA) tended to increase annually, suspected due to chronic immunosuppression condition by HIV/AIDS [8]. As we know that dental caries still becomes an oral health problem and burden worldwide, especially in Indonesia. The previous report conducted by the Republic of Indonesia, Ministry of Health in Basic Health Research Report or *Riset Kesehatan Dasar* (RISKESDAS) mentioned that Indonesian national DMFT index was high at 4.6 without insignificant improvement since 2007 [9]. World Health Organization (WHO) study among 190 countries showed that the prevalence of dental caries in Indonesia was ⁴⁰ the highest worldwide with a mean of about 2.1 [10]. Indonesia has been a country with the highest dental caries prevalence in Southeast Asian (SEA) Region [11,12].

During HIV/AIDS infection and progression, there was immune system disturbance. AIDS occurred in all parts of the body during the HIV progression without exception [13]. A Cluster of Differentiation 4 (CD4⁺) in the lymphocyte's surface was remarkably marker to detect the immunosuppression status of PLWHA. CD4⁺ counts decreased significantly resulted in an error in the homeostasis and immunity mechanism against the microorganism. Mucosal immunity as the oral cavity defense was weakening in the HIV/AIDS that can lead to increased normal flora colonies in the oral cavity [14-16]. *Streptococcus mutans* was commensal bacteria in the oral cavity and well known as dental caries etiology. During the HIV/AIDS progression, *S. mutans* colonies increased significantly but not genotypes [17]. Teeth and the oral cavity were an integral part of Gastro-Intestinal-Tract (GIT), which is important for digestion and nutrition intake in CLPWA. Dental caries and oral manifestation that occurred in HIV/AIDS disturb the nutrition intake that can lead to nutrition deficiency, which made immunosuppression condition even worsen [18].

The prevalence of dental caries can be assessed using decayed-missing-filling (dmft) or DMFT. DMFT/dmft index was the easiest, simplest, reliable, valid, commonly used for oral health assessment [19]. This study hypothesized high dental caries prevalence in CLWPHA increased due

to low CD4⁺ counts. To date, there was no study about the correlation CD4⁺ count with high caries prevalence in CLPWA in Surabaya, Indonesia. Thus, ³⁶ the main objective of this study was to investigate ^{the} correlation CD4⁺ count with high dental caries prevalence in CLPWA treated at Tertiary General Hospital, Surabaya, Indonesia.

Material and Methods

Study Design

This study was analytical observational research with a cross-sectional design. Randomize total sampling method was used. Twenty-nine HIV-positive perinatally-infected children aged 1-12 years were recruited from outpatient ward Infectious Disease Intermediate Unit or *Unit Perawatan Intermediet dan Penyakit Infeksi* (UPIPI) Tertiary General Hospital Dr. Soetomo Surabaya accordance the inclusion criteria (e.g., HIV Seropositive) and exclusion criteria (e.g., never underwent CD4⁺ examination).

CLPWA HIV/AIDS Diagnosis

Physician Specialist in Children Health Department (by DH) was done the diagnosis of CLPWA under 12 years old according to Standart Protocol from the Ministry of Health, Republic of Indonesia Guideline. Confirmed CLPWA was attending the UPIPI, Tertiary General Hospital Doctor Soetomo Surabaya Indonesia during the study period.

Dental Caries Assessment and Other Data Recapitulation

Dental caries examination was performed by a triple examiner during the study period using disposable sterile mouth mirrors. ²² Dental caries was assessed by decayed, missing, filled teeth (dmft) in primary teeth and DMFT in permanent teeth index were used. Retrospective data such as demographic details including age, gender, tooth brushing frequency, and latest six months CD4⁺ counts examination was recorded from their medical records and their parents/guardian by personal guided questionnaire interview.

¹⁴ Statistical Analysis

¹⁸ Data were analyzed using IBM SPSS Statistics Software, version 18 (IBM Corp., Armonk, NY, USA). Pearson's and Spearman's Correlation test ($p < 0.05$) based on Shapiro-Wilk and Levene's test ($p < 0.05$) were performed.

Ethical Clearance Approval

Tertiary General Hospital Doctor Soetomo, Surabaya, East Java local institutional Health ethical clearance committee was reviewed and approved this study setting design with number: 326 / PANKE.KKE / V / 2017.

Results

This present study found a high prevalence of dental caries about 86.2%. In addition, the dmft/DMFT index score found were high (8.2 / 6.3). Male CLWPHA patient was more prevalent than female (51.7%). The most CLWPHA patient was five years old (Figure 1). All CLWPHA patients underwent ARV therapy.

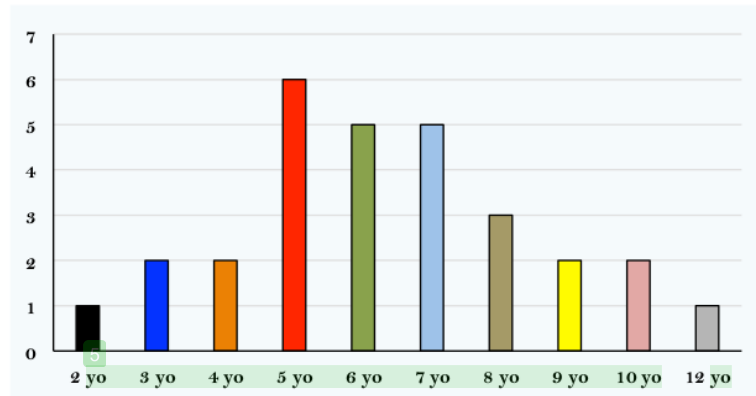


Figure 1. Distribution of children according to age.

Antiretroviral (ARV) therapy and caries showed an insignificant negative correlation ($p < 0.05$). Mostly CLWPHA has low CD4+ of about 69% (Figure 2).

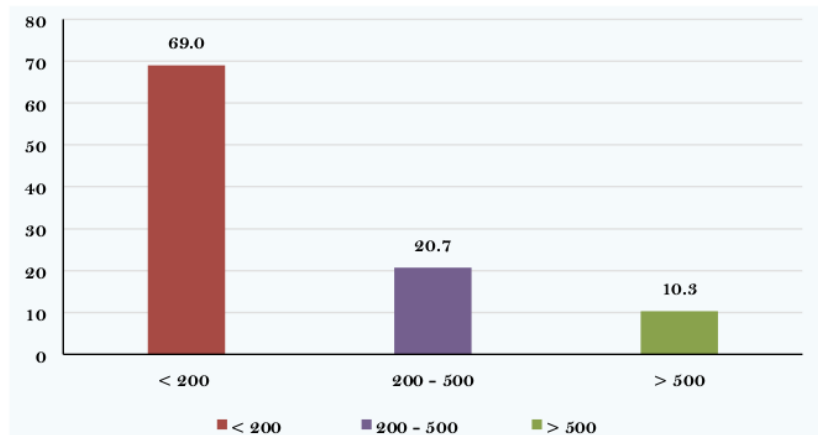


Figure 2. Distribution of CD4+ counts in CLWPHA.

CD4+ count was normally distributed and homogenous ($p > 0.05$). CD4+ count and caries showed significant correlation ($r = -0.394$, $p < 0.05$). Mostly CLWPHA patients in the present study did not brush their teeth frequently (only 1x per day = 72.4%; 2x per day = 10.3% and 17.3% did not brushing their teeth). Tooth brushing frequency with caries showed a significant correlation ($r = -0.419$, $p < 0.05$).

Discussion

High dental caries prevalence in CLWPHA was found in this study. This result was not in line with previous findings that demonstrated that dental caries prevalence was low in CLWPHA Bangalore, India [20]. Meanwhile, this study founding in line with the previous survey in Iran showed the prevalence of dental caries increased in PLWHA [21,22]. Xerostomia commonly occurred in HIV/AIDS as a result of salivary gland hypofunction [23,24]. It influences the salivary flow rate tends to decrease. Thus, dental caries will occur easily in PLWHA [25]. DMFT/dmft index score was found very high in this study. Previous studies showed dental caries prevalence in CLWPHA was very high in deciduous tooth found dmfs score about 11.00 for 2-5 years old patient and 7.0 for 6-11 years old patient which is supported our study result [26,27].

All patients who participated in this present study mostly underwent ARV treatment. ARV was a golden choice for HIV/AIDS treatment, but resulted in dental caries in two different ways: (1) ARV influences decreased salivary flow rate which is important for oral cavity immunity, (2) ARV contained high glucose concentration [21,27]. Nevertheless, in this study was found there was an insignificant correlation ARV treatment and dental caries prevalence. It is suspected that the patient not consumed ARV daily; meanwhile, CD4⁺ counts in all patient was low.

CD4⁺ counts were an important marker to predict immunosuppression status during HIV/AIDS progression in CLWPHA [3,5,28]. Low CD4⁺ counts were found in this study, and it is correlated with high dental caries prevalence in CLWPHA. High dental caries prevalence was found in CLWPHA with a severe degree of immunosuppression CD4⁺ counts group, while a decreased of CD4⁺ counts was associated with increased dental caries prevalence [22]. Contrary, a study in Nigerian conducted found an insignificant correlation between dental caries prevalence and degree of immunosuppression status in CLWPHA, but dental caries in the deciduous tooth is greater than normal Nigerian children population [29].

For that reason, this study also analyzed the tooth brushing frequency, which is important to maintain oral hygiene. Unfortunately, this present study found almost all CLWPHA did not maintain their oral health only brushed their teeth once daily, and there was a negative significant correlation between tooth brushing frequency and caries. The prevention of dental caries in children can be done by toothbrushing with fluoridated toothpaste. Oral hygiene plays a pivotal role in decrease the risk of dental caries [26,27].

Conclusion

For the first time, the dental caries prevalence of CLWPHA in Surabaya, Indonesia CLWPHA was presented. Surprisingly, the low CD4⁺ counts correlated with high dental caries prevalence in CLWPHA. In addition, further investigation with a better setting and larger area are required.

Authors' Contributions: APN, MPM, BS, DH, EAT, RAP and DSE designed the study, performed the data collection, data analysis and interpretation, wrote the manuscript and reviewed the manuscript. All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest: The authors declare no conflicts of interest.

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