South Kalimantan Wetlands Community Empowerment in Reducing Tooth Decay Index

Rosihan Adhani

Faculty of Dentistry, Lam Bung Mangkurat University,
Jl. Veteran No.128 B, 3255444 Banjarmasin, Indonesia

Abstract: Tooth decay or caries is the most common disease found in oral cavity. Caries experience of children aged 12 years or older in South Kalimantan reached 83.4% thus placing the disease as the main problem of oral health. According to 2013 Riskesdas/basic health research, the highest tooth decay index in South Kalimantan was found at Barito Kuala (48.6%) and Banjarmasin (23.8%), the numbers were higher than province's average of 36.1% with DMF-T index of Barito Kuala, Banjarmasin and South Kalimantan as high as 6.61, 5.54 and 6.83, respectively. Both of the regions had river water flowing through them which were streaming in from the swamps around the river area or commonly known as wetland or peat. The condition eventually produced water with pH around 3.5-4.5. The community's dependence on that water for consumption and in particular, their incorrect teeth brushing technique greatly affected tooth decay. Data shown pointed out percentage of the correct teeth brushing technique only reached 3.4, 11.3, 5.0% for Barito Kuala, Banjarmasin and South Kalimantan, respectively. DMF-T index counting at Madrasah Tsanawiyah and chosen high schools in both regions on June 2014 showed numbers of DMF-T in community using PDAM water for teeth brushing as 2.05, river water as 5.46 with DMF-T average of 3.75 (moderate). The life style of teeth brushing using river water aggravated tooth decay progress. Empowerment of community by civilizing people to use water qualifying in adequate health requirements could be utilized as a preventive effort to decrease caries index.

Key words: Caries, DMF-T index, wetlandpeat water, technique, tooth, decay

INTRODUCTION

Oral health condition in Indonesia had its own spotlight of concern whereas approximately, 90% Indonesians suffered from oral diseases (Said *et al.*, 2009). While in South Kalimantan, around 36.1% of population had problematic oral health with only 8.0% of accessibility to oral health medical services or Effective Medical Demand (EMD). Tooth decay had a significant effect on the whole body health because it could disturb daily activities through symptoms like continuous pain and discomfort. The disease was a tooth (or more) away from better human resources quality and able to detain standard of living improvement, especially in a number of employment lines such as army, polices, pilots and flight attendants where applicants would immediately be declined if they had (any) tooth decay.

Barito Kuala and Banjarmasin residents had the highest tooth decay index in South Kalimantan with DMF-T index of 6.61 and 5.54, respectively. The high caries index in both areas couldn't be detached from people's lifestyles which were very dependent on river water to fulfill their daily needs. Barito Kuala and Banjarmasin were flanked by three major rivers: Barito, Martapura and Kapuas rivers, most of the areas were wetlands consisted of swamps and peats. Third quarters of South Kalimantan was located <100 m from sea surface, making around 8.000 km^2 of its area as swamps filled with peat water. On the other hand, 40.858 ha of Barito Kuala with ditto condition had water with pH around 3.5-4.5 and was suspected to have negative effects on people's oral health. Percentage of families with access to clean water was still <50%. Most families (51.7%) still used river water as resources to satisfy their needs. Inadequate access to clean water fulfilling health standards had impact on people's comprehensive health level. Knowledge and skills to process river water into drinkable water were self-taught thus a qualified result was questionable.

Physical environment and people's behaviors would affect oral health condition. People's behavior of living in the area alongside rivers was practiced from generation to generation until it became a tradition. Teeth brushing habit using river water with high acidity would give negative impacts on people's oral health. Data showed that the percentage of correct teeth brushing habit only

reached 3.4% for Barito Kuala, 11.3% for Banjarmasin and 5.0% for the whole South Kalimantan. People's awareness of how important oral health was in holistic well-being was still very low.

Considering this background, there was a growing concern that deemed it important to make a review about caries severity in wetlands community and the available problems-solving methods and its alternatives through community empowerment; this guideline had a purpose of increasing people's knowledge and awareness of oral health and river-water-into-qualified-drinkable-water processing steps. The function of this review was to build a synergic cross-departments team work in both research and public service to help solve public problems, especially in wetlands community of South Kalimantan.

Many public health problems were affected by social and cultural aspects. These aspects influenced people, their minds, behaviours and many of their life decisions. Ethnographic and health anthropologic researchers emphasized that a successful governmental program needed not only the ability to obtain scientific explanation of a disease but also to behold community's values and beliefs weighing the disease itself.

Soejoeti described that a community's health level or psycho socio somatic health being was a resultant of 4 factors: environment, behaviour, hereditary, population distribution, etcetera and also health care service such aspreventive, promotive, curative and rehabilitative programs. Out of those 4 factors, environment and behaviour were the most dominant factors of health level. Such conclusion was also applied in dental health, Blum (Kidd dan Smith, 2012) stated that a person or community's oral health was affected by four important factors of hereditary, environment (physical or social culture), behaviour and health service. Out of those 4 factors, behaviour held the most important role in oral health condition.

Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) in Iran, 1972 described in Article 1.1 that "wetlands are areas of marsh, fen, peatland or water whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt including areas of marine water the depth of which at low tide does not exceed 6 m".

Wetlands are swamp areas which throughout the year or for a long period in a year was always water-saturated or water-logged by shallow water. According to Kusnaedi, peat water of wetlands is surface water commonly found in tidal areas and swamps or lowlands especially in Sumatera and Kalimantan with characteristics as:

- High color intensity (yellow or brownish red)
- Low pH (2-5)
- High organic substances
- Acidic taste
- Low cation substances

Tooth decay mechanism from these characteristics is explained as: Wetlands water or peat water has acidic pH and because of its high Cation Exchange Capacity (CEC), the Base Saturation (BS) is low. The deeper a wetland is then the more acidic its water is. Moreover, organic substances decomposition in anaerob condition causes phenolic and carboxylate compounds to form, thus making its pH even more acidic. This acidic condition is what plays the accused in tooth decay process.

Mouth cavity exposed to this peat water would make oral pH drop until it reaches critical enamel pH of 5.5. H^+ ions contained in peat water would bind to PO_43-ions from saliva and forms HPO_43-. In this form, HPO_43-couldn't balance enamel and saliva condition, thus enamel crystals are easily dissolved.

Caries is tooth decay occurring from interaction of tooth surface bacteria or biofilms and dietary components such as carbohydrate that could be fermented by plaque bacteria into acid (Angela, 2005).

Tooth decay starts from enamel to dentin and is a disease involving many factors. There are four main factors in tooth decay: host, microorganisms, substrates and time (Imron and Amrul, 2010). Caries is marked by enamel and dentin minerals demineralization followed by their organic substances destruction. Oral cavity's high acidity level would accelerate caries progress.

A number of plaque bacterias such as Streptococcus mutanshad the ability to ferment carbs substrates in food (such as sucrose and glucose) and form acid; causing pH level to drop below 5 or 4.5 in approximately 1-3 min.

The acidic level would return to normal (pH of 6-7) only after 30-60 min later. This level would fluctuate depending on individual's oral activites. pH's continuous drops in a certain period of time would result in demineralization of tooth surface and thus the carious progress started (Hegde and Shija, 2011).

Caries index was an indication of how high a person or a community's caries status is. Caries index formulation for permanent dentition was DMF-T index (DMF-Teeth); consisted of D: Decayed: Total of carious teeth that could still be restored.M: Missing: Total of extracted teeth or indicated for extraction because of caries. F: Filled: total of restored teeth and in good condition. DMF-T equation was described as such:

$$\text{DMF-T Index} = \frac{\text{Total} + D + M + F}{\text{Total samples}}$$

According to WHO, DMF-T index was categorized as:

Very low = 0, 0-1.1
Low   = 1.2-2.6
Moderate = 2.7-4.4
High   = 4.5-6.5
Very high = ...<6.6

MATERIALS AND METHODS

Method used was action research. Research started with observation of caries index among MTSN Marabahan, SMPN 4 and SMPN 15 Banjarmasin students. Samples were picked randomly from the population with total samples of 120 students.

Samples were divided into two groups of 60 students with teeth brushing habit using river water and 60 students with teeth brushing habit using PDAM water. Caries index measurement of MTSN Marabahan students was performed on 19 June 2014 of 30 students using river water and 30 students using PDAM water. Measurement of SMPN 4 Banjarmasin students was performed on 21 June 2014 of 30 students using river water and 30 students using PDAM water and measurement of SMPN 15 Banjarmasin was performed on 23 June 2014.

Tools and materials used were diagnostic sets, cottons, 70% alcohol and DMF-T index measurement sheets. Series of activities carried out were counseling about correct teeth brushing method, brushing teeth together and caries index measurement.

Social culture study was performed in Barito Kuala dan Banjarmasin from 23-3 July 2014 by carrying out interviews of 20 informants, consisted of Barito Kuala DinasKesehatan staffs, head and staffs of two Puskesmas, Marabahan and Mandastana, public figures and a number of people still using river water for their daily needs. The same data collecting in Banjarmasin was carried out from 15-25 July 2014.

RESULTS AND DISCUSSION

Results of caries index measurement of two sample groups was inputted into Table 1 and Fig. 1 and then analyzed. DMF-T index measurement results showed that there was a difference of caries index level among the samples. Students using PDAM water to brush their teeth had DMF-T index average of 2,05 or categorized as low

Table 1: DMF-T index measurement result

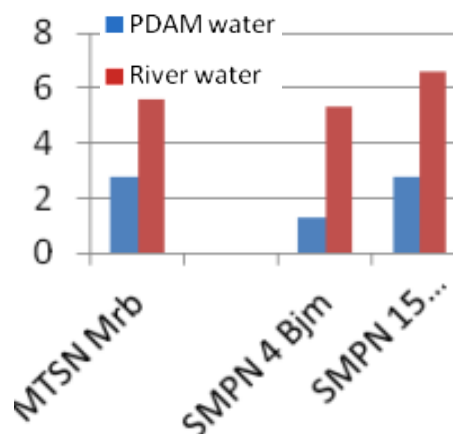| Samples	Brushing teeth using		
	PDAM water	River water	DMF-T average
MTSN Marabahan	2.8	5.60	4.20
SMPN 4 Banjarmasin	1.3	5.33	3.31
SMPN 15 Banjarmasin	2.8	6.60	4.70
DMF-T average	2.3	5.84	4.09

Fig. 1: Bar Chart.DMF-T index measurement esult

and students using river water to brush their teeth had DMF-T index average of 5.46 categorized as high.

The difference of caries index was caused by daily tooth-brushing habit contrast. River water used by students living in wetlands area had high acidity level of 3.5-4.5. Mouth cavity exposed to this peat water would make oral pH drop until it reaches critical enamel pH of 5.5. H+ ions contained in peat water would bind to PO_4^{3-} ions from saliva and forms HPO_4^{3-}. In this form, HPO_4^{3-} couldn't balance enamel and saliva condition, thus enamel crystals are easily dissolved.

Community's physical environment (living close to river) and rare access to PDAM forced people to use river water without adequate processing for daily needs. From social cultural survey, data obtained showed that using river water for bathing, washing and toilet and tooth brushing created a feeling of togetherness among people and saved money but people were not aware of the effect of using river water with acidic pH on oral health and they only thought it necessary to consult after pain symptom existed.

Alternative of that problem-solving could be achieved through community empowerment of how to process river water into clean water qualifying health standards. Appropriate, cheap and easy technology application could be used to process peat water. Peat water processing steps are explained as (Fig. 2).
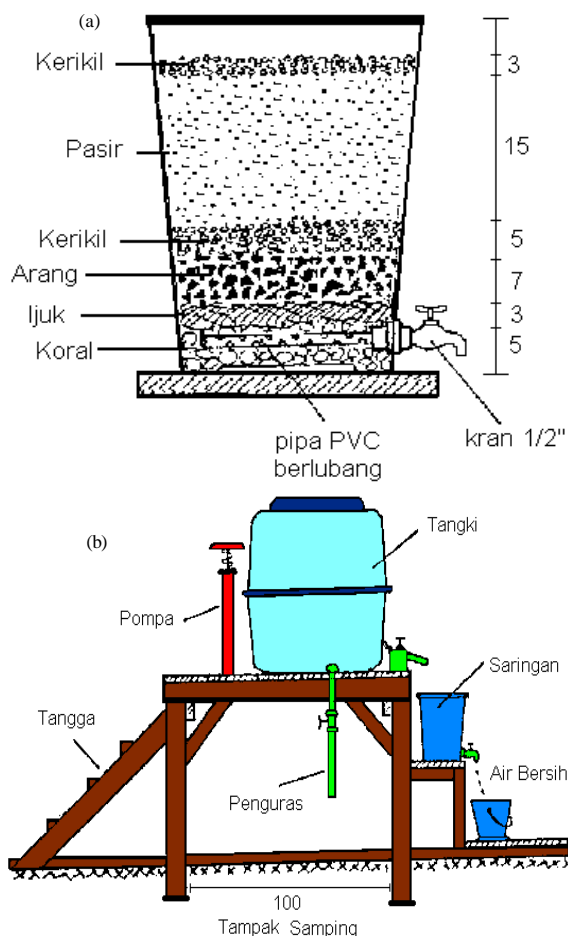
Fig. 2: Peat water processing steps

Procedures:
- Fill reservoir with 550 L of peat water
- Dissolve 60-80 gramslime powders/limestones (4-6 tablespoons) in a small bucket filled with standard water. Then pour it into the reservoir and stir evenly
- Put in aeration tube into the reservoir's floor and do 50-100 pumpings before taking the tube out

- Dissolve 60-80 g alum (4-6 tablespoons) in a small bucket then pour it into the aerated water. Stir swiftly to the same direction for 1-2 min. Afte that, lift the mixer tool and let the water swirls by itself until it eventually stops and let it sit for 45-60 min. Open the draining tap to remove dirty deposit and close it back again
- Open output tap and let it flow into filtering basin. Open filtering tap and make sure that water in the basin doesn't overflow

CONCLUSION

Caries index had 4 factors contributing to its severity: physical environment, behavior, hereditary and health services. Wetlands water with acidic pH consumption increased tooth decay level. Social culture aspect about river water processing to help decrease caries index level needed to be developed and its empowerment model needed to be created. One of the problem solving alternatives could be carried out through public empowerment to process peat water into drinkable water. Cross-sectorals collaboration, especially health, environment and social culture sectors, ought to be established in overcoming this problematic dilemma.

REFERENCES

Angela, A., 2005. Primary Prevention of Caries in Children at Risk High. Majalah Kedokteran Gigi, Yogyakarta, Indonesia,.

Hegde, M.N. and A.S. Shija, 2011. Carious first molars in South Canara population-an epidemiological study. J. Indian Dent. Assoc., 5: 1132-1132.

Imron, M. and M.D. Amrul, 2010. Research Methodology the Health Field. Sagung Seto, Jakarta, Indonesia,.

Kidd, E.A.M. and B.G.N. Smith, 2012. Conservation Manual Restorative According to Pickard. Widya Medika, Jakarta, Indonesia,.

Said, F., I. Rahmawati and S. Hadayati, 2009. Picture of oral and dental hygiene brushing knowledge of public school students Hapingin class IV and V Batang Alai District of North Hulu Sungai Tengah. Buletin Penelitian RSUD DR. Soetomo, 3: 148-50.