ORIGINAL RESEARCH

CORRELATION BETWEEN SMOKE-FREE AREAS AND SMOKING BEHAVIOR IN INDONESIA

Korelasi antara Penerapan Kawasan Tanpa Rokok dan Perilaku Merokok di Indonesia

Mohamad Anis Fahmi
Institut Ilmu Kesehatan Bhakti Wiyata Kediri, mohamadanis.fahmi@gmail.com
Correspondence Author: Mohamad Anis Fahmi, mohamadanis.fahmi@gmail.com, Institut Ilmu Kesehatan Bhakti Wiyata Kediri, KH. Wahid Hasyim St, Number. 65, Bandar Lor, Mojoroto, Kediri City, East Java, 64114, Indonesia

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ABSTRACT

Background: Low public awareness of the impact of smoking makes the implementation of smoke-free areas (KTR) difficult. Smoke-free areas aim to protect the public from the direct and indirect effects of smoking. **Purpose:** This study aimed to analyze the correlation between the application of smoke-free areas and the prevalence of active and ex-smokers in Indonesia. **Method:** This study implemented a cross-sectional design, using secondary data from the Riskesdas 2018 on active and ex-smokers. KTR application data were obtained from the Profile of Non-Communicable Diseases in 2016. A Pearson product-moment test was conducted by a computer application to determine the correlation coefficient (r). This coefficient was used to describe the level of correlation between the two variables; significance was determined as a p value of 5%. **Results:** This study showed that the average application of KTR throughout Indonesia was 50.83%, active smokers comprised 23.49% of the population, and ex-smokers comprised 4.94%. Most active smokers were in Java and Sumatra, while the majority of ex-smokers were in Java and Sulawesi and the majority of KTR was in Java. This study shows that there is a positive correlation between KTR application and the percentage of ex-smokers (r = 0.46; p value = 0.01). **Conclusion:** There is a positive correlation between the application of KTR and an increase in ex-smokers. The government needs to increase the application of KTR policies.

ABSTRAK

Latar Belakang: Penerapan Kawasan Tanpa Rokok (KTR) di Indonesia sulit karena kesadaran bahaya aktifitas merokok yang masih rendah. Kawasan tanpa rokok bertujuan mengurangi dampak buruk langsung maupun tidak langsung pada kesehatan masyarakat. Tujuan: Penelitian ini bertujuan untuk menganalisis korelasi antara penerapan kawasan tanpa rokok dengan prevalensi perokok aktif dan

*mantan perokok di Indonesia. **Metode:** Penelitian ini menggunakan desain studi cross-sectional dengan data sekunder dari Laporan Riskesdas 2018 untuk data perokok aktif dan mantan perokok. Data penerapan KTR diperoleh dari Profil Penyakit Tidak Menular tahun 2016. Subjek penelitian ini adalah seluruh provinsi di Indonesia. Uji Pearson Product Moment dengan bantuan aplikasi komputer untuk mencari koefisien korelasi (r). Koefisien ini digunakan untuk menggambarkan besarnya korelasi antara kedua variabel, kemaknaannya menggunakan p value dengan alpha 5%. **Hasil:** Penelitian ini menunjukkan bahwa rata-rata penerapan KTR di seluruh Indonesia adalah 50,83%, perokok aktif 23,49% dan mantan perokok sebesar 4,94%. Sebagian besar perokok aktif ada di Jawa dan Sumatra, mantan perokok ada di Jawa dan Sulawesi, dan penerapan KTR mayoritas ada di Jawa. Penelitian ini menunjukkan adanya korelasi positif kategori sedang antara persentase penerapan KTR dengan persentase mantan perokok (r=0,46; p-value=0,01). **Kesimpulan:** Terdapat korelasi positif antara penerapan KTR dengan peningkatan mantan perokok, sehingga pemerintah perlu meningkatkan penerapan kebijakan KTR.*

INTRODUCTION

At least half of global deaths were caused by non-communicable diseases (NCDs) in 2008. The NCDs that most often lead to death include cardiovascular disease, diabetes, cancer, and chronic respiratory diseases. Deaths due to NCDs are expected to rise throughout the world due to increasing NCD impacts and an aging population. NCDs have the largest impact on low-income countries, as they can also lead to the deaths of young people. Most NCDs can be prevented by reducing the four main behavioral risk factors – tobacco use, dangerous alcohol use, physical inactivity, and unhealthy diet (WHO, 2011).

Almost six million people die from smoking each year, both active and passive smokers. This number is expected to increase to 7.50 million in 2020. Smoking causes lung cancer, chronic respiratory diseases, and cardiovascular disease. The majority of male smokers are in developing countries. The highest smoking prevalence is in middle-income countries or developed countries (WHO, 2012).

In 2016, in Indonesia, NCDs were the leading cause of death. Cardiovascular disease is the most common NCD in Indonesia. Other NCDs include cancer, chronic lung disease, and diabetes (WHO, 2018). Both traditional and modern societies in Indonesia have made smoking a part of life (Juliansyah, Solehati, & Kosasih, 2018).

The joint regulation from the Minister of Health and the Minister of Home Affairs (number 188/Menkes/PB/I/2011) regarding guidelines for the implementation of non-smoking zones, states that a smoke-free area (KTR) is a restricted area or room not to be used for activities related to the production, sale, and promotion of cigarettes. The purpose of the KTR policy is to guide regional governments in developing KTR rules in different regions, to reduce health risks, especially for groups of passive smokers. The non-smoking areas are present in health, education, play, worship, public transportation, work, public places, and other facilities (Minister of Health & Minister of Home Affairs RI, 2011). At present, the application of the KTR policy in districts throughout Indonesia follows a pattern of horizontal diffusion, with poorer districts and underdeveloped villages slower at implementing this policy (Septiono, Kuipers, Ng, & Kunst, 2019).

Previous research has shown that the application of KTR is associated with a decrease in the number of smokers and an increase in smoking cessation rates. It has also led to reduced blood pressure as part of preventing NCD. A study conducted by Kelly, Vuolo, Frizzell, & Hernandez (2018) identified that smoking bans play an important role in reducing the prevalence of smokers. Mayne et al (2018) found that KTR policies in bars, restaurants, and workplaces were

associated with lower systolic blood pressure. Titus et al (2015) found that the application of smoke-free laws and policies in the workplace were correlated with higher chances of quitting smoking in respondents aged 40 to 54.

Awareness about the dangers of smoking in Indonesian society is relatively low; therefore, the application of KTR becomes more difficult. People in the five to nine-year-old age group have started consuming cigarettes. The two age groups with low cigarette consumption are those aged 15 to 24 and those over 75. The productive and young age (<15 years old) group has a high number of smokers, especially in rural areas (Minister of Health & Minister of Home Affairs RI, 2011). This study aims to analyze the correlation between the introduction of non-smoking areas and the prevalence of active smokers and former smokers in Indonesia.

METHOD

This study adopted a cross-sectional design, using secondary data from the 2018 Riskesdas Report concerning active smokers and ex-smokers. KTR application data were obtained from the Profile of Non-Communicable Diseases in 2016. The inclusion criteria for this study encompassed all provinces in Indonesia, while the exclusion criteria omitted provinces that were not in the Quantum Geographic Information System (GIS) map format, so North Kalimantan province was not included in this study .

The independent variable examined in this study was the introduction of KTR, while the dependent variable was smoking behavior, consisting of active smokers and ex-smokers. Univariate and bivariate analyses were carried out. A univariate analysis was conducted to obtain an understanding of the application of KTR, the percentage of active smokers, and the percentage of ex-smokers, using a map.

The introduction of KTR and the prevalence of smoking behavior was mapped using a computer application. Classification of KTR application and smoking behavior was based on quintiles of all values in each variable. This analysis was used to determine the distribution between provinces and islands, especially for the five largest islands in Indonesia. A correlation analysis using the Pearson product-moment test was used to find the correlation coefficient (r). The significance level of the correlation coefficient was determined as a p value of 5%. This analysis was used to determine the correlation between the application of KTR and the percentage of active smokers and ex-smokers.

RESULTS

KTR Application in Indonesia

Research conducted in 34 provinces in Indonesia shows that each province has implemented KTR. Figure 1 shows the distribution of KTR implementation in all provinces of Indonesia. The average application of KTR throughout Indonesia is 50.83%. The lowest KTR application is 6.90% of all regencies/cities in one province. There is one province where all regencies/cities have implemented KTR.

The distribution based on the five major islands in Indonesia shows that Java has the most regions that have implemented KTR. Papua has minimal application of KTR. The provinces of the Yogyakarta Special Region (DIY), Bali, Lampung, Jambi, Bangka Belitung Islands, South Kalimantan, and South Sulawesi have a high application of KTR. The lowest application of KTR is in Aceh, North Sumatra, Riau, West Kalimantan, North Sulawesi, Southeast Sulawesi, Maluku, Papua, and West Papua (Figure 1).

Active Smokers in Indonesia

The average prevalence of active smokers in Indonesia was 23.49% in 2018. The lowest prevalence of smokers in Indonesia was 2.10% and the highest was 28.10%. West Sumatra, Bengkulu, Lampung, West Java, NTB, and Central Sulawesi have the largest percentage of smokers. The distribution based on islands showed that the highest percentage of smokers are in Java and Sumatra. Papua is the province with the lowest prevalence of smokers (Figure 2).

Ex-smokers in Indonesia

The average prevalence of ex-smokers in Indonesia is 4.94%. The prevalence of ex-smokers ranges from 2.20% to 14.40%. The distribution by island shows that most areas in Java and Sulawesi have higher rates of ex-smokers compared to other islands. Most ex-smokers are in Riau, West Sumatra, Jakarta, Central Java, DIY, East Kalimantan, North Kalimantan, Bali, and Central Sulawesi (Figure 3).
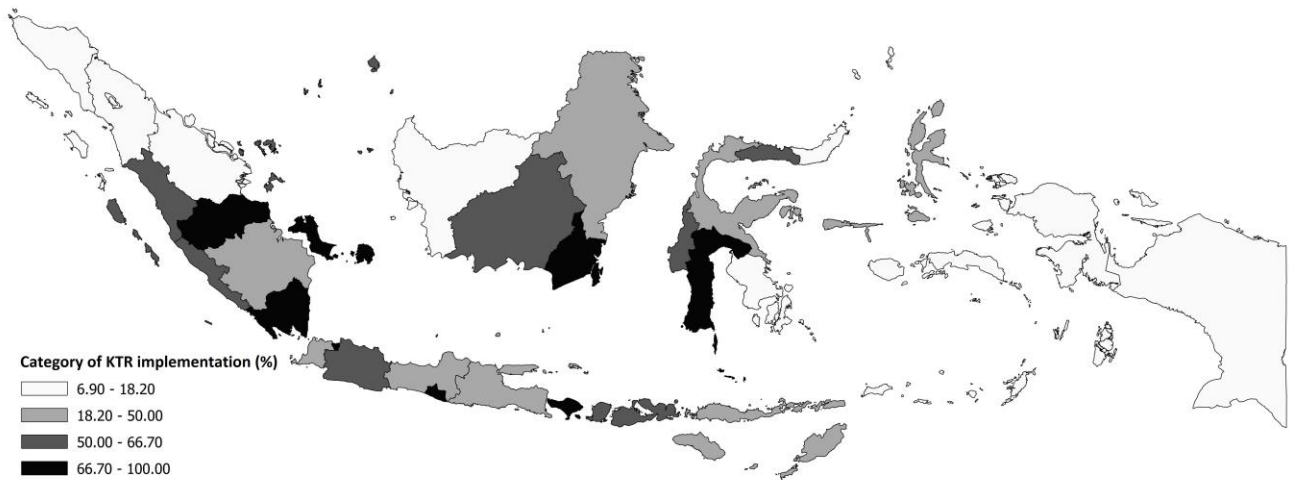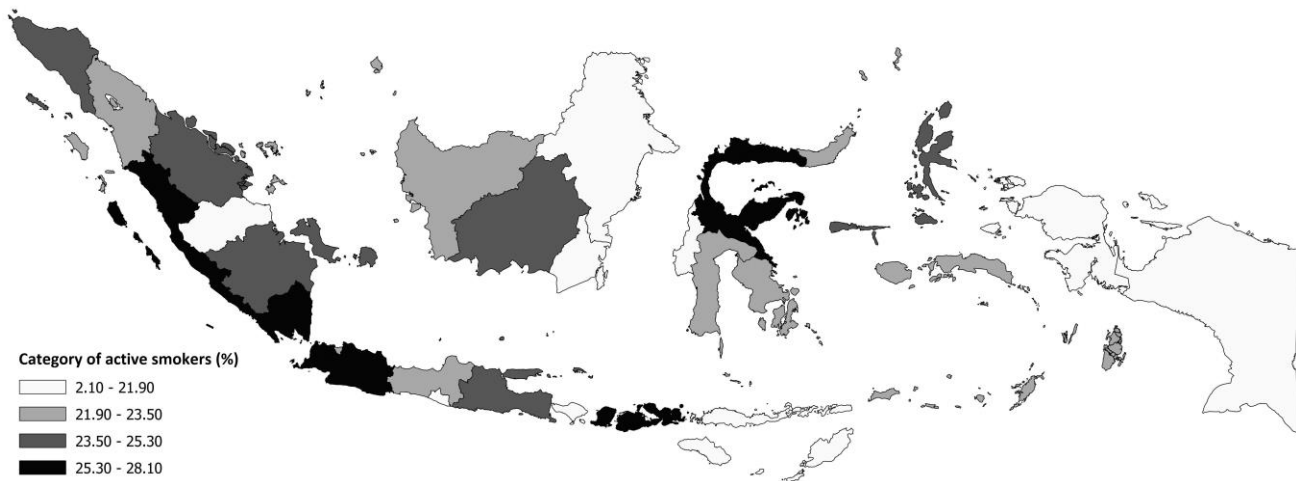
Figure 1. KTR Implementation in Indonesia

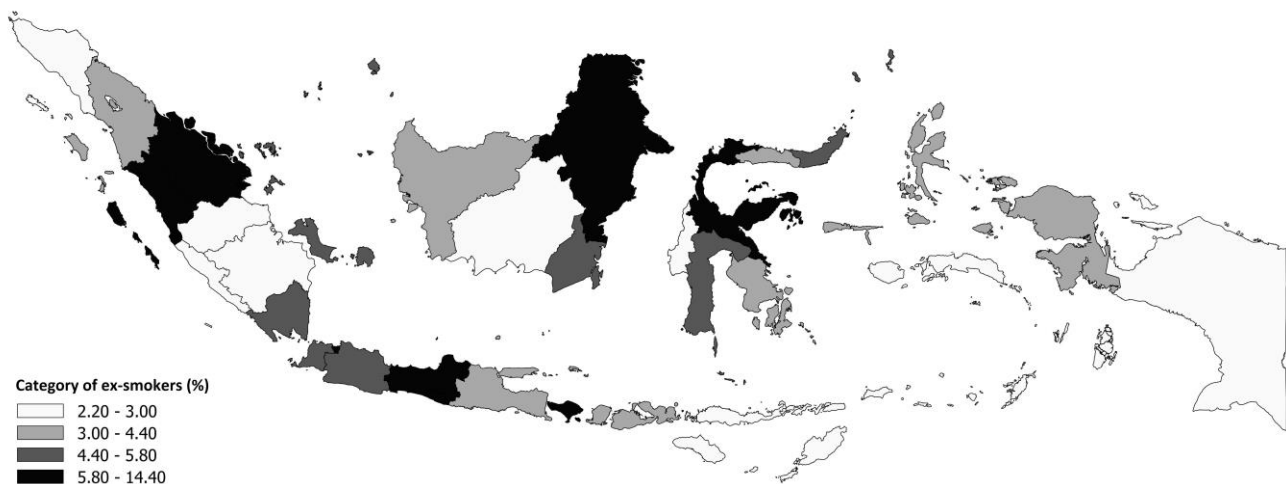**Figure 2.** Active Smokers in Indonesia

Figure 3. Ex-Smokers in Indonesia

Correlation between The Application of KTR and active smokers

KTR application data are normally distributed, so the Pearson product-moment test can be performed. This test was conducted to determine whether there is a correlation between the application of KTR and smoking behavior in Indonesia. The analysis determined a correlation coefficient (r) of 0.07 and a p value of 0.67. The significance level used was 5% (0.05), so this

correlation is not significant. There is no significant correlation between the application of KTR and the prevalence of smoking behavior in Indonesia (Figure 4).

Correlation between The Application of KTR and Ex-Smokers

The Pearson product-moment test was also used to determine the correlation between the application of KTR and ex-smokers. The analysis results obtained an r value of 0.46 and a p value of 0.01; therefore, there is a significant correlation between the application of KTR and ex-smokers. The value of the correlation coefficient indicates that this correlation is in the medium category. The correlation line is seen rising away from the horizontal line (Figure 5).
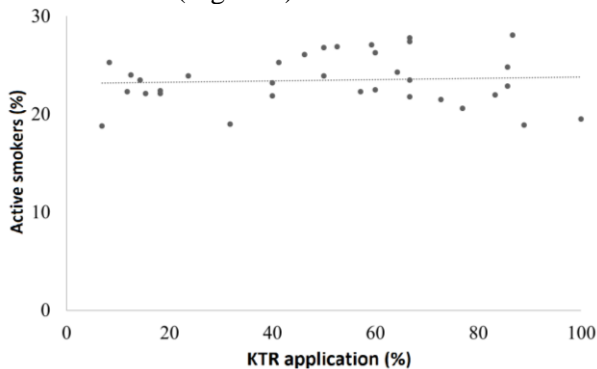

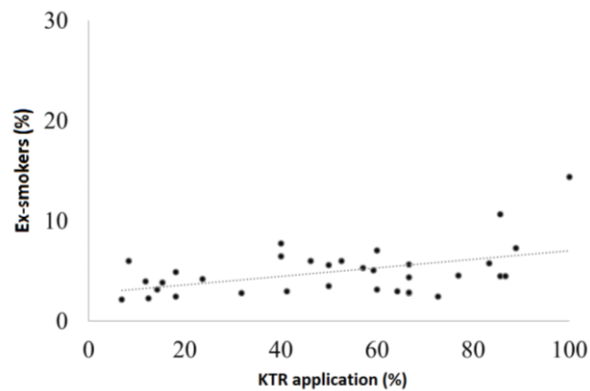**Figure 4.** Correlation line between KTR application and active smokers

Figure 5. Correlation line between KTR application and ex-smokers

DISCUSSION

The application of KTR does not guarantee a decrease in the prevalence of active smokers in Indonesia. This is related to resource limitations and a lack of coherent enforcement of regulations. Some methods to improve compliance with smoking bans include implementing strict penalties and education on KTR for the general public. Community organizations also need to support the application of rules through education, stakeholder engagement, and advocacy, based on evidence and experience. Developing countries, including Indonesia, may need more support to effectively plan policy implementation (Robertson et al., 2018).

Other research shows the pros and cons of smoking bans. Studies on subsidized and commercial houses show that the majority of people support the prohibition of smoking indoors anywhere in the house. The community is less supportive of policies to ban smoking only in subsidized homes and allow smoking in non-subsidized units (Mcmillen, Winickoff, Gottlieb, Tanski, & Klein, 2019).

The association between smoking and deaths from lung cancer in some studies is very close. The results of López-Campos et al (2018), study in Europe show several changes in the trend of deaths from lung cancer over time, but these changes were not related to the application of KTR regulations. The trend of deaths from lung cancer in Europe has not changed several years after the introduction of the KTR law. This is likely because there is no significant correlation between the application of KTR and a decrease in active smokers.

Incorrect knowledge of KTR policies and the perception that exposure to passive cigarettes is harmless can inhibit the acceptance of KTR policies among smokers. Implementation of KTR policies to support compliance can be improved by increasing information about the risks of exposure to secondhand smoke for smokers and nonsmokers (Anthony et al., 2019).

According to Azmi, Istiarti, & Cahyo (2016), there is no relationship between KTR knowledge, KTR physical implementation, KTR guidance, KTR supervision, KTR sanctions, and smoking behavior in students; therefore, extra effort needs to be expended so that KTR regulations can reduce the number of active smokers. According to Navas-Acien, et al (2016), regulating the provision of ashtrays can make smokers consider their smoking behavior in certain places. Ashtrays are determinants of smoking behavior that can be modified and must be removed from all public places.

There is no decrease in the number of smokers in regions that have implemented KTR, possibly because people do not know about KTR. The results of a study by Panjaitan, Khadijah, & Dameanty (2015), show that the KTR function was not known in the community because the local

government was not communicating to school leaders about the application of KTR. The function of KTR is not well known because of the lack of supporting facilities and infrastructure, the bureaucracy that has not yet run, and implements unresponsive policies. Navas-acien et al (2016) explain that the level of KTR compliance in Turkey is 92.30%. Health and education institutions have high compliance with smoke-free laws. Students are one of the parties that can be empowered to optimize the implementation and compliance functions of KTR. Students can advocate for policymakers to encourage KTR to be obeyed by the community, especially on campus. Defined punishments might be appropriate to encourage campus residents to adhere to KTR within the tertiary environment. Social media can also be used for health promotion and to inform individuals about the importance of adhering to KTR (Trisnowati & Sunarti, 2016).

A correlation between the application of KTR and a decrease in ex-smokers was identified. This is likely due to the intensive application of local law. Safeguarding infrastructure and efforts to implement KTR regulations are very important in encouraging smokers to quit. The addition of law enforcement resources for KTR in the community is necessary, even with minimal penalties (Peruga, Hayes, Aguilera, Prasad, & Bettcher, 2018). Studies conducted in several major cities in Indonesia found that the application of KTR can reduce the proportion of active smokers. Factors that can influence this include local government commitment, law enforcement, supervision, stakeholder compliance, and the active role of organizations in society (Rahajeng, 2015).

Research in America also shows the same results, that the application of KTR can reduce the frequency of smoking in public places. Trends in the frequency of smoking in parks and beaches in New York declined significantly over six quarters after the KTR law came into force. These results are consistent with previous studies and provide evidence that KTR laws can reduce smoking in public places (Johns, Farley, Rajulu, Kansagra, & Juster, 2015).

Kumar et al (2014) explained that full compliance with KTR regulations in India was 51.00%. Educational institutions and health facilities have 65.00% and 62.00% compliance, respectively, while restaurants and other public places (such as bus stops, train stations, shopping centers, stadiums, and cinema halls) have low compliance (37.00% and 27.00%). The presence of a smoking ban is the biggest contributor to compliance in all public places. KTR compliance in public places in India is suboptimal, especially with the absence of a smoking ban.

A meta-analysis study found that more than half of educational institutions support KTR policies. There is a decrease in the prevalence of smoking among students in educational institutions that support KTR. The majority of students and lecturers support the campus smoke-free policy because it can reduce smoking habits (Lupton & Townsend, 2015).

The association of KTR with a decrease in smoking is consistent with a decrease in cardiovascular disease. Consistent with previous ecological studies, Mayne et al (2018) found that KTR policy was associated with a lower risk of cardiovascular disease in middle-aged adults. Communities living in areas that apply KTR in restaurants, bars, or workplaces have a lower risk of the incidence of cardiovascular disease compared to areas that do not apply KTR.

The only prevention method that protects individuals against health damage caused by passive smoking is the establishment of an environment that is completely smoke-free, regardless of age and gender, without exception (Kokubo & Padmanabhan, 2018). Research by Jones, Barnoya, Stranges, Losonczy, & Navas-acien (2014) found that, 20 years after enacting the KTR law, there was a decrease in acute coronary heart disease in hospitalizations. This decrease was greater in locations that implemented comprehensive legislation than in locations that only applied partial regulations. The benefits of applying KTR to prevent cardiovascular disease emphasize the importance of KTR regulations to protect citizens from cigarette smoke, especially in public places.

Increasing the application of KTR in Indonesia is possible with the support of different parties. Hock et al (2019) research shows that, in Malaysia, a country with a culture similar to Indonesia, the application of KTR-type programs can run very well. The non-smoking law was well received and supported by the adult Malaysian community. Health education programs with special emphasis on smoking must be conducted regularly to advise of the health hazards for passive smokers and encourage behavior change. Strong support for smoke-free laws leads to good results in expanding smoke-free zones and establishing more public places that are smoke-free.

Research Limitation

This study uses secondary data, so it is unknown when KTR was first implemented in each district in each province.

CONCLUSION

The application of KTR in Indonesia is still not optimal and its distribution is uneven. In this study, there was no significant correlation between the application of KTR and active smokers, but there was a positive correlation between the application of KTR and the percentage of ex-smokers. The more areas that apply KTR, the more smokers decide to quit. Recommendations to reduce the percentage of active smokers and reduce cardiovascular disease include protecting the environment from cigarette smoke by applying KTR, especially in public places.

CONFLICT OF INTEREST

The authors declare that no conflict of interest in this study.

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