THE RELATIONSHIP BETWEEN KNOWLEDGE OF CARIOGENIC FOODS AND DENTAL CARIES EXPERIENCES AMONG STUDENTS AGED 12–15 YEARS IN PASAMAN REGENCY

Eka Sukanti[1*] , Aflinda Yenti[2] , Muhammad Faisal[3] , Cici Idela[4] , Arnetty[5]
[1,2,3,4,5] *Department of Dental Health, Padang Public Health Polytechnic, Ministry of Health, INDONESIA*

**Corresponding author:* ekasukanti@gmail.com

Abstract

The current high prevalence of dental and oral diseases is influenced by behavioral factors. These behaviors are closely linked to the public's knowledge of dental and oral health. Adolescents have more caries due to the habit of consuming cariogenic foods. According to the 2018 Riskesdas survey, the prevalence of dental problems in the 12-year-old age group was 82%, and in the 15-year-old age group, it was 47%. This study aims to determine the relationship between knowledge of cariogenic foods and caries experience (DMF-T index) among students aged 12–15 years in Pasaman Regency. This is a descriptive-analytical study using a quantitative method with a cross-sectional design. Total sampling was used. Data analysis employed the Chi-Square test with a significance level of $p < 0.05$. The results showed that knowledge of cariogenic foods was "good" in 59.7% (77 students) and "poor" in 40.3% (52 students). Caries experience (DMF-T index) was "good" in 55.8% (72 students) and "poor" in 44.2% (57 students). The results of the Chi-Square statistical analysis, using a 95% significance level ($\alpha = 0.05$), yielded a p-value of $0.000 < 0.05$. The conclusion of this study is that there is an association between knowledge of cariogenic foods and dental caries experience among students aged 12–15 years in Pasaman Regency.

Keywords: Knowledge, Cariogenic Foods, Dental Caries Experiences

1. INTRODUCTION

Health is a state of physical, mental, and social well-being in which a person is not only free from disease but is also able to live a productive life. Health efforts encompass all forms and a series of actions undertaken by the central government, local governments, and the general public to promote, prevent, treat, rehabilitate, and provide palliative care for public health[1] . In addition to general health, oral and dental health is also of critical importance, as it can affect overall physical health, well-being, and quality of life[2] .

According to the 2018 Basic Health Research, the prevalence of oral health problems in Indonesia was 78.8%, with the following breakdown: 45.3% had damaged, decayed, or painful teeth; 19% had missing teeth due to extraction or natural loss; 4.1% had teeth that had been filled due to decay; and 10.4% had loose teeth. West Sumatra Province has a caries prevalence of 77.43%, with 43.87% of teeth damaged, decayed, or painful; 19.61% of teeth lost due to extraction or natural loss; 3.51% of teeth filled due to cavities; and 10.44% of teeth loose. Meanwhile, the proportion of dental problems in Pasaman Regency is 64.83%, with the following breakdown: 39.38% of teeth are damaged, decayed, or painful; 14.65% of teeth are missing due to extraction or natural loss; 1.09% of teeth have been filled or capped due to cavities; and 9.71% of teeth are loose. Based on age groups (WHO), the proportion of dental problems among 12-year-olds is 82%, with 43.43% having damaged, decayed, or painful teeth; 23.43% having lost teeth due to extraction or natural loss; 1.67% having teeth that have been filled or capped due to cavities; and 13.78% having loose teeth; while at age 15, the figures were 47%, with 33.54% of teeth damaged, decayed, or painful; 7.51% of teeth lost due to extraction or natural loss; 2.53% of teeth filled or capped due to cavities; and 3.48% of teeth loose[3] .

The current high prevalence of dental and oral diseases is influenced by behavioral factors. These behaviors are closely linked to the public's level of knowledge regarding dental and oral health[4] . Individuals acquire knowledge through sensory perception of specific objects. Knowledge is gained through stimuli captured by the five senses. Knowledge can also be acquired systematically, namely through the educational process. Actions are shaped by knowledge[5] .

Junior high school (SMP) students are typically between the ages of 12 and 15[6] . The ages of 12 to 15 mark early adolescence. At this stage, adolescents often become self-centered and spend more money on snacks and treats[7] . Adolescents are more prone to tooth decay due to their habit of consuming cariogenic foods[8] . Excessive consumption of sugary foods and beverages can trigger diseases and health problems in the teeth and mouth. Bacteria in the mouth convert sugar into acid that can erode tooth enamel. The higher the daily sugar intake, the higher the risk of developing dental caries[9] .

Based on a preliminary study conducted among 12- to 15-year-old students at SMP Negeri 1 Rao Utara in Pasaman Regency, interviews and DMF-T examinations were performed on 8 students. Of the 8 students interviewed, all reported frequently consuming cariogenic foods such as sucking on candy, eating chocolate, and bread, and they also frequently consumed sweetened tea. In addition to their preference for sugar-containing foods, they also demonstrated limited knowledge about maintaining oral health. The examination results showed that 6 students had 15 decayed (D) teeth, 1 missing (M) tooth, and no fillings (F), while the other 2 students had healthy teeth.

2. METHODOLOGY

The research method used in this study was descriptive-analytical research with a cross-sectional design. The population in this study consisted of all students aged 12–15 years at SMP Negeri 1 Rao Utara, Pasaman Regency, totaling 144 students in grades VII, VIII, and IX. The sampling technique used in this study was total sampling with the inclusion criteria of students who were present and willing to participate as respondents. Of the 144 students in the population, 3 were absent and 12 were unwilling to participate, resulting in a sample of 129 students. Data collection was conducted by administering a questionnaire and measuring the DMF-T index. The data collection instrument used in this study was a questionnaire that had undergone validity and reliability testing. The examination tool was used to determine the decayed, missing, and filled teeth (DMF-T) index.

The data analysis performed in this study consisted of univariate and bivariate analyses. Univariate analysis was presented in the form of frequency distribution tables, using the following criteria: for knowledge, a score of ≥55% was classified as "Good" and <55% as "Poor"; for the DMF-T index, a value of ≤1 was classified as "Good" and >1 as "Poor." Bivariate analysis was used to examine the relationship between two variables. The chi-square test was employed in this study to assess the relationship between literacy regarding cariogenic foods and dental caries experience (DMF-T index).

3. RESULTS AND DISCUSSION

3.1 Knowledge of Cariogenic Foods Among Students Aged 12–15 in Pasaman Regency

The results of the study on knowledge of cariogenic foods among students aged 12–15 in Pasaman Regency are shown in the following table:

Table 1. *Frequency Distribution of Knowledge About Cariogenic Foods Among Students Aged 12–15 in Pasaman Regency*

Knowledge Criteria	F	%
Good	77	59.7
Not so good	52	40.3
Total	129	100

Table 1 shows the frequency distribution of knowledge about cariogenic foods among students aged 12–15 years, indicating that 59.7% (77 students) met the "good" criteria, while 40.3% (52 students) met the "poor" criteria.

Based on the research findings, the high proportion of students meeting the “good” criteria for knowledge about cariogenic foods among 12–15-year-old students in Pasaman Regency may be influenced by information sources, which can be obtained from various channels such as print media, electronic media, and social media—for example, posters, television, and the internet. Age may also influence a person’s knowledge, as thinking becomes more mature with increasing age. Supported by the questionnaire results, students who already understand the definition of cariogenic foods (68%), understand the frequency of cariogenic food consumption that can increase the risk of cavities (60%), understand the duration of food exposure in the mouth (85%), understand the prevention of dental caries (94%), and understand the consequences of frequent consumption of cariogenic foods (88%).

Students with insufficient knowledge may lack interest in learning about cariogenic foods; if someone lacks a strong interest or desire to learn about a subject, they will have limited knowledge of that subject. Supported by the questionnaire results, students were unaware of the types of carbohydrates (33%), the forms and types of cariogenic foods (53%), foods that are beneficial for teeth (49%), and non-cariogenic foods (43%).

This aligns with the theory that individuals who receive more information will expand their knowledge. A person’s reaction to new information is influenced by how and from whom they obtain that information; various sources can serve as information channels, including interpersonal sources (health workers, community leaders, religious leaders, members of youth or women’s organizations, teachers, village development cadres, or government outreach officers), social media, print media, or electronic media. Wider access to information enhances a person’s understanding of a subject[10] .

Age can also influence a person’s knowledge; a person’s physical and psychological (mental) aspects change as they grow older. Generally, physical growth consists of four types of changes: changes in size, changes in proportions, the loss of old characteristics, and the acquisition of new ones. These changes are caused by difficulties in performing organ functions. Psychologically or mentally, as a person ages, their way of thinking becomes more mature and sophisticated[11] . Interest is defined as a strong inclination or desire toward something. This drives a person to try and learn more about that particular subject[12] .

The results of this study are consistent with those of a previous study titled “The Relationship Between Knowledge Levels Regarding Cariogenic Foods and Decay in Permanent Teeth Among Third-Grade Students at SD Muhammadiyah 2 Denpasar in 2025,” which found that the majority of students met the “good” criteria (48 students, 96%), one student met the “fair” criteria (2%), and one student met the “poor” criteria (2%)[13] .

3.2 Dental Caries Experience (DMF-T Index) Among Students Aged 12–15 Years in Pasaman Regency

The results of dental caries prevalence (DMF-T Index) among students aged 12–15 years in Pasaman Regency are shown in the following table:

Table 2. *Frequency Distribution of Dental Caries (DMF-T Index) Among Students Aged 12–15 Years in Pasaman Regency*

DMF-T Criteria	f	%
Good	72	55.8
Poor	57	44.2
Total	129	100

Table 2 shows the frequency distribution of dental caries experience (DMF-T index) among students aged 12–15 years, indicating that 55.8% (72 students) met the “good” criteria, while 44.2% (57 students) met the “poor” criteria.

These descriptive data indicate that respondents with a “good” DMF-T index likely attribute this to drinking water or rinsing their mouths after consuming sweet foods or beverages. According to student interviews, they brush their teeth at least twice a day—in the morning after breakfast and at night before bed—using fluoride toothpaste.

Students with a DMF-T index in the “poor” category may have teeth with deep pits and fissures, making it easier for food debris to get trapped and harder to clean. Bacteria in the mouth contribute to the formation of caries, particularly due to frequent consumption of cariogenic foods such as cakes, bread, and chocolate.

This aligns with the theory that efforts to reduce the DMF-T index and prevent dental caries include rinsing the mouth or drinking water after consuming cariogenic foods or sugary drinks[14] . Brushing teeth is a method of removing plaque and food debris left on the tooth surfaces. Brush your teeth twice a day for 2 minutes—in the morning after breakfast and at night before bed[2] . Regular use of fluoride toothpaste helps protect teeth from cavities because fluoride strengthens enamel, inhibits demineralization, and supports remineralization, thereby reducing the risk of dental caries[15] .

Dental caries is caused by the interaction of various factors, namely the host, microorganisms, substrate, and time. Teeth with deep pits and fissures are more prone to plaque retention, thereby increasing the risk of caries. The cariogenic bacteria that play a key role in this process are Streptococcus mutans, which are capable of fermenting carbohydrates into acids, thereby causing demineralization of the hard tissues of the teeth[14],[15] . High consumption of cariogenic foods, especially those containing sucrose and that easily adhere to the tooth surface, can lower the pH of saliva to a critical level, thereby accelerating the caries process[16],[17] . In addition, improper toothbrushing habits and excessive consumption of cariogenic foods have been shown to be associated with an increased incidence of dental caries in children and adolescents[18],[19] .

The results of this study are consistent with those of a previous study examining the relationship between knowledge of cariogenic foods and the DMF-T index among 7th-grade students in Class VII A at SMPN 4 Pineleng, Minahasa Regency, which found that 56.6% met the “good” DMF-T index criteria and 43.4% met the “poor” criteria[22] .

3.3 The relationship between knowledge of cariogenic foods and dental caries experience (DMF-T index) among 12- to 15-year-old students in Pasaman Regency

The results of the study on the relationship between knowledge of cariogenic foods and dental caries experience (DMF-T index) among 12–15-year-old students at SMPN 1 Rao Utara, Pasaman Regency, are presented in the table below:

Table 3. *Results of the Chi-Square Test on the Relationship Between Knowledge of Cariogenic Foods and Dental Caries Experience (DMF-T Index) Among Students Aged 12–15 Years in Pasaman Regency*

Criteria Knowledge	DMF-T Criteria						p-Value
	Good		Poor		Total		
	f	%	f	%	f	%	
Good	55	71.4	22	28.6	77	100	0.000
Not very good	17	32.7	35	67.3	52	100	

Table 3 presents a cross-tabulation of the relationship between knowledge of cariogenic foods and dental caries experience (DMF-T index) among students aged 12–15 years, showing that 71.4% (55 students) had good knowledge and a good DMF-T index, while 67.3% (35 students) had poor knowledge and a poor DMF-T index.-T index also meeting the “good” criteria, at 71.4% (55 students), while those with “poor” knowledge had a “poor” DMF-T index at 67.3% (35 students).

Next, to examine the relationship between respondents’ knowledge of cariogenic foods and their experience with dental caries (DMF-T index), a chi-square test was conducted. Based on the results of the chi-square statistical analysis using SPSS, the results in the “Asymp. Significance” column—using a 95% significance level (α = 0.05)—show that the p-value of 0.000 is below 0.05 (0.000 < 0.05). This means that the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. Based on the results of this Chi-Square analysis, it can be concluded that there is an association between knowledge of cariogenic foods and the experience of dental caries (DMF-T index) among students aged 12–15 years in Pasaman Regency.

Based on the study's findings, good knowledge can positively influence the caries index if that knowledge is applied in daily behavior; conversely, insufficient knowledge can lead to a poorer caries index, as knowledge influences an individual's behavior in maintaining their oral health.

These findings align with the theory that the higher a person's level of knowledge, the greater their attention and concern for oral health. Knowledge is one of the factors influencing an individual's health behavior. Individuals with good knowledge tend to understand the appropriate actions for both the prevention and management of diseases, including oral diseases[23] .

The findings of this study also align with previous research showing a significant association between the level of knowledge about cariogenic foods and the DMF-T index score. This indicates that good knowledge regarding cariogenic foods plays a role in shaping behaviors that support the maintenance of oral health, thereby influencing caries status as measured by the DMF-T index[20],[21],[24] .

Based on the research findings and existing theory, it can be concluded that knowledge plays a crucial role in influencing oral health status. The better a person's knowledge of oral health, the greater the likelihood of adopting good oral health maintenance behaviors, thereby minimizing the risk of dental caries as reflected in the DMF-T index. However, knowledge must be supported by behavioral and environmental factors to produce sustainable health changes.

4. CONCLUSION

The study results indicate a significant association between the level of knowledge about cariogenic foods and the incidence of dental caries. Students with better knowledge tend to have a lower incidence of dental caries compared to students with poorer knowledge. Therefore, improving knowledge about cariogenic foods should be a key focus in promotive and preventive efforts for oral health.s

REFERENCES

[1] R. Kemenkes, Undang-Undang Republik Indonesia Nomor 17 Tahun 2023 Tentang Kesehatan, no. 187315. Indonesia, 2023, pp. 1–300.

[2] WHO, "Oral Health: Seventy-Fourth World Health Assembly," 2021.

[3] Badan Penelitian dan Pengembangan Kesehatan, "Riset Kesehatan Dasar Provinsi Sumatera Barat Tahun. Laporan Riskesdas Nasional 2018.," 2018, Badan Penelitian dan Pengembangan Kesehatan, Jakarta.

[4] Marlindayanti, N. A. Hanum, Ismalayani, and Y. Heriyanto, Manajemen Pencegahan Karies. Kediri: Lembaga Chakra Brahmanda Lentera, 2022.

[5] N. M. Sirat and A. A. G. Agung, Buku Ajar Ilmu Kesehatan Masyarakat. Malang: Media Nusa Creative, 2023.

[6] Kemendikbud, Peraturan Pemerintah Republik Indonesia No 57 Tahun 2021 tentang Standar Nasional Pendidikan, no. 102501. Indonesia, 2021.

[7] I. E. Yani et al., Perencanaan Pangan dan Gizi : Menjaga Kesehatan Anda dengan Pola Makan Seimbang. Padang: Get Press Indonesia, 2023.

[8] U. Utami et al., "Food Consumption Frequency and Dental Caries Status among Adolescents in Jakarta," vol. 13, no. 3, pp. 1054–1058, 2020, doi: 1309-100X.

[9] R. Kementrian Kesehatan, Profil Kesehatan Indonesia. Jakarta: Kementrian Kesehatan Republik Indonesia, 2019.

[10] T. W. J. Hatibie, A. Bata, and N. Adjim, "Pemanfaatan Sistem Informasi Kesehatan untuk Meningkatkan Akses dan Kualitas Layanan Kesehatan di Desa," vol. 2, no. 2, pp. 215–221, 2023.

[11] Estherita and A. Novianty, "Positive Mental Health Literacy in Adolescent and Young Adult," vol. 13, no. 2, pp. 93–104, 2021, doi: http://doi.org/10.31289/analitika.v13i1.5053.

[12] M. S. Klinik, “Cavities and Tooth Decay: Symptoms and causes.” Accessed: Jun. 14, 2026. [Online]. Available: https://www.mayoclinic.org/diseases-conditions/cavities/symptoms-causes/syc-20352892

[13] N. M. Sirat, A. A. Senjaya, N. N. D. Supariani, A. A. G. Agung, and P. I. Pradnyaswari, “Hubungan Tingkat Pengetahuan tentang Makanan Kariogenik dan Karies Gigi Tetap Siswa Kelas III di SD Muhammadiyah 2 Denpasar Tahun 2025,” vol. 12, no. 1, pp. 77–87, 2025, doi: 10.33992/jkg.v%vi%i.4178.

[14] WHO, “Oral health,” 2025, Geneva.

[15] R. S. Levine, “Fluoride in toothpaste - is the expressed total fluoride content meaningful for caries prevention?,” Br. Dent. J., vol. 228, no. 10, pp. 795–799, May 2020, doi: 10.1038/s41415-020-1540-8.

[16] P. D. Marsh, “Dental plaque as a biofilm and a microbial community – implications for health and disease,” vol. 7, pp. 1–7, 2006, doi: 10.1186/1472-6831-6-S1-S14.

[17] J. D. B. Featherstone, “The Science and Practice of Caries Prevention,” vol. 131, no. 7, pp. 887–899, 2000, doi: https://doi.org/10.14219/jada.archive.2000.0307.

[18] A. Rekawati and F. Frisca, “Hubungan kebiasaan konsumsi makanan kariogenik terhadap prevalensi karies gigi pada anak SD Negeri 3 Fajar Mataram,” Tarumanagara Med. J., vol. 2, no. 2, pp. 205–210, 2020, doi: 10.24912/tmj.v3i1.9719.

[19] R. W. Soeryani, A. Nurrochman, W. Nurwanti, and S. T. Khoirunisa, “Perubahan pH Saliva Sebelum dan Sesudah Mengonsumsi Makanan Kariogenik,” vol. 1, no. 2, pp. 31–34, 2020, doi: https://doi.org/10.36082/qjk.v13i2.88.

[20] L. Hakim, N. Afrinis, and Alini, “Hubungan Frekuensi, Waktu Menyikat Gigi dan Kebiasaan Konsumsi Makanan Kariogenik dengan Kejadian Karies Gigi pada Anak Usia Dini di TK Pertiwi Tahun 2022,” vol. 4, no. 1, pp. 18–28, 2025.

[21] Rusnoto, C. B. Romantis, M. Purnomo, and M. Jauhar, “Perilaku Menyikat Gigi dan Konsumsi Makanan Kariogenik Pemicu Karies Gigi pada Anak,” vol. 14, no. 2, pp. 518–527, 2023.

[22] A. A. Tahulending and G. T. Rugo, “Hubungan Pengetahuan Tentang Makanan Kariogenik dengan Indeks DMF-T pada Siswa Kelas VII A SMPN 4 Pineleng Kabupaten Minahasa,” vol. 1, no. 1, pp. 36–42, 2018.

[23] K. S. Dewi, H. A. Koesomah, N. Nurjannah, and D. M. Laut, “Gambaran Tingkat Pengetahuan Kesehatan Gigi dan Mulut di RW 15 Perum Baros Kencana Kota Sukabumi,” vol. 2, no. 2, pp. 691–697, 2021.

[24] A. Yenti, Damhuji, and H. Y. Safitri, “The Relationship between Frequency of Consumption of Cariogenic Foods and DMF-T Index in 12-Year-Old Children of Dental Health , Poltekkes Kemenkes Padang , Padang City , West Sumatra , Indonesia 2 Department of Dental Health , Poltekkes Kemenkes Pontiana,” vol. 17, no. 3, pp. 1008–1013, 2023, doi: https://doi.org/10.33860/jik.v17i3.3395.