

Eye and dental health

Plan a lesson on the theme of infectious diseases and human rights.

[7-5] Propose a new lifestyle for a new era of people living with the novel coronavirus in Cambodia.

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Learning objectives

You will be able to gain proper understanding and explain:

- How we can see an object and why refractive errors occur, and explain how we can prevent eye diseases.
- The function of a tooth, the causes of dental caries, gingivitis, and periodontal disease, and explain how we can prevent them.

This chapter explains the mechanisms of the eyes and the teeth, diseases related to them, and prevention of those diseases. Eyes and teeth, which are organs familiar to children in that they can easily observe them, provide them with opportunities to experience, for example, preventive measures in practice and make them realize the outcomes of health learning easily. Therefore, eye and dental health is one of the teaching and learning materials of school health familiar to all members of a class.

1. Eye health

1) Importance of eye health

Eye and dental diseases significantly affect our health not only during school age but also in adulthood. Loss of sight in particular is a serious issue. Cambodia implemented the national strategic plan to prevent loss of sight (2008–2015) with a focus on the **National Program for Eye Health**, and achieved the goal of making the rate of blindness 0.5% or lower.¹ Nevertheless, an estimated 28,800 people still suffer from loss of sight or visual impairment. The leading cause of loss of sight and visual impairment is cataracts (approx. 19,000 people), but they can also be caused by leaving refractive errors that occur during school age untreated. It is said that 80–90% of these causes are preventable or treatable.²

Meanwhile, about 20% of children have missed a class due to a toothache over the last 12 months, indicating that dental health is an issue that should be given priority for school-age children.³ The school age is a period in which milk teeth (deciduous teeth) are replaced by permanent teeth, and leaving dental caries or periodontal disease untreated during this period can invite exacerbation later and result in loss of teeth in adulthood.

Therefore, it is very important to learn eye and dental health in school health classes during school age.

2) How we can see an object

The **ophthalmus** is an intricate organ that allows us to clearly see things in the outside world and is often compared to a camera. The **cornea** and **crystalline lens**, which correspond to camera lenses, pass and refract light. The **retina** corresponds to camera film. An object in the outside world can be clearly seen when the image refracted by the cornea and crystalline lens is focused on the retina surface (**Figure 8.1**). The **ciliary muscle** surrounding the crystalline lens focuses an image on the retina by becoming tense or loose according to the distance to the object that is seen. Whether an image can be focused on the retina surface depends on the refractive power of the lens and the distance from the front surface of the lens to the retina (the axial length of the eye).

Column: Eye and ophthalmus

The eye covers a region that is larger than the region of the ophthalmus. The eye refers to the entire eye as a part of the face, including the eyelid, the inner corner of the eye, the outer corner of the eye, and the eyeball. Meanwhile, the ophthalmus, which is a term in medicine and physiology, refers to the **eyeball**.

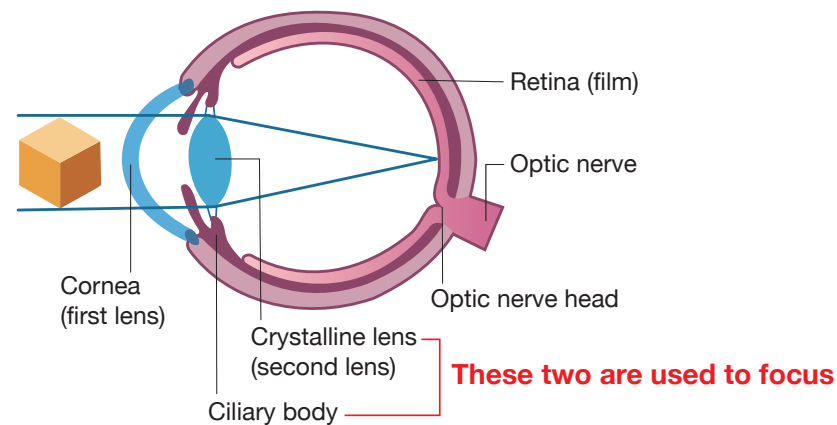


Figure 8.1 How we can see an object (Structure of the eyeball)

3) Eye diseases that can cause visual impairment

As diseases that can cause reduced vision or loss of sight, which are common in Cambodia, we can cite **cataracts, glaucoma, diabetic retinopathy, trachoma, vitamin A deficiency, and refractive error**.¹ Described below are the outlines of these diseases.⁴

(1) Cataracts

Cataract is a disease in which the crystalline lens becomes opaque. The opaque crystalline lens impairs light transmission, resulting in visual impairment and eventually loss of sight. The leading cause of cataract is aging, but there are also cases associated with systemic disease such as diabetes and atopic

dermatitis, cases caused by a traumatic injury like perforation or the contusion of the eyeball, and cases of congenital cataracts. There are drug therapies and surgical treatments. Drug therapy can slow the progression of the disease but cannot remove the crystalline lens opacity. Recovery of sight requires surgery in which the opaque crystalline lens is removed and replaced with an artificial lens.

(2) Glaucoma

Glaucoma is a disease in which increased intraocular pressure and the fragility of the optic nerve impair the optic nerve, resulting in visual impairment. **Intraocular pressure** is the pressure inside the eyeball and has the role of maintaining the shape of the eyeball. Symptoms of glaucoma are reduced vision and visual field defects, but often, no symptoms are developed in the early stage. If the state of increased intraocular pressure continues, it impairs the optic nerve and results in loss of sight. Although glaucoma is mostly primary (cases in which there is no original disease or the cause is unknown), there are also cases that occur secondary to other diseases. There are drug therapies and surgical treatments, one of which is selected depending on the pathological condition (state of the disease).

(3) Diabetic retinopathy

Diabetic retinopathy is a disease in which persistent hyperglycemia weakens vessel walls in the eye, causing angiopathic lesions of the retina. It is one of the three major complications of diabetes and occurs several to ten-odd years after the person is affected by diabetes. There are often no symptoms in the early stage, and retinopathy has already significantly advanced by the time symptoms are noticed. Symptoms are **misty vision** (the whole vision is blurred), **myodesopsia** (a symptom in which a small flying object like an insect appears in the vision), reduced vision, and visual field defect, which eventually result in loss of sight. Depending on the symptom, surgery to coagulate retinal tissue using a laser, or surgery on the vitreous body is performed. It is important to control blood glucose along with the treatment of diabetes.

(4) Trachoma

Trachoma is conjunctivitis caused by repeated infection with *Chlamydia trachomatis*. In severe cases, a lot of conjunctival vessels enter the cornea and make it opaque, resulting in loss of sight. It is common in preschool children. To treat the disease, new quinolone antibiotic eye drops or eye ointment are used, or a tetracycline or macrolide antibiotic is taken orally. Not sharing towels and bedding, as well as washing hands and faces frequently can help prevent home infection.

The real situation and magnitude of trachoma is still unknown. However, it is assumed that in Cambodia trachoma still remains a major public health problem, though no nationwide surveys have ever been carried out. Cambodia is a member of the WHO Global Alliance for Elimination of Trachoma. A rapid assessment of trachoma and its risk factors is planned in 3 provinces with objectives to determine the occurrence of blinding trachoma, measure its magnitude, and the severity of the problem.²

(5) Vitamin A deficiency

Vitamin A is a nutrient that is related to the reception of photic stimulation as well as the differentiation and functional maintenance of epithelial cells (see Chapter 5). Deficiency in vitamin A can cause **night**

blindness or make the conjunctiva and the cornea dry enough to cause visual impairment. Night blindness is a disease characterized by a significant reduction of vision in the dark, caused by impaired rod cells that usually function in the dark (see Chapter 2). When the conjunctiva is dried, moving the eyeball may make wrinkles in the conjunctiva, or show dull, dirty white spots (Bitot spots) in the palpebral conjunctiva. If the symptoms progress further to dry the cornea, an ulcer is formed, and in severe cases, a hole in the cornea may have been developed resulting in loss of sight. To treat the disease, vitamin A is administered. Intake of a proper amount of vitamin A is also effective in prevention.

(6) Refractive errors (hyperopia, myopia, and astigmatism)

Uncorrected refractive error is major cause of visual impairment. An estimate of prevalence of visual impairment due to refractive errors accounts for 52.8%. In children refractive errors affected approximately 10% in urban areas and 1.5% in rural areas.¹ Meanwhile, there is also a report stating that about 70% of refractive errors in children were **myopia**,² indicating the importance of early detection and prevention of exacerbation of refractive errors, particularly myopia, during school age.

Normal refraction refers to the condition of the ophthalmus in which parallel rays are correctly focused on the retina when an object is seen in the non-accommodative state (state in which nothing is being done). The condition in which they are not correctly focused is called **refractive error**. There are three types of refractive errors: **hyperopia**, **myopia**, and **astigmatism** (Figure 8.2).

a. Hyperopia

Hyperopia refers to the condition of the ophthalmus in which parallel rays are focused posterior to the retina in the non-accommodative state, thus producing an unfocused, unclear image on the retina. The causes of this include a short axial length of the eye and weak refractive power of the cornea or the crystalline lens. In hyperopia, it is difficult to clearly see both far and near objects, and particularly near objects. Consultation with a specialist is required depending on the severity, but leaving it untreated may lead to reduced vision or cause amblyopia or esotropia.

b. Myopia

Myopia refers to the condition of the ophthalmus in which parallel rays are focused anterior to the retina in the non-accommodative state, thus producing an unfocused, unclear image on the retina. The causes of this include a long axial length of the eye and strong refractive power of the cornea or the crystalline lens. In myopia, it is not possible to clearly see far objects but possible to clearly see near objects. School children with myopia may find it difficult to see letters on the blackboard. In addition, as they have to narrow their eyes, or knit their brows to see objects, they may experience headaches.

Column: Asians and myopia

The prevalence of myopia in schoolchildren has been reported to be higher in Asian countries than in Europe and other regions (20–30%), with the rate of myopia being 45.7% for high school students in Korea, 70.3% for those aged between 12 and 19 in Taiwan, 78.4%⁵ for those aged 15 in China (Guangzhou), and 76.5% for those aged between 6 and 11 and 94.9% for those between 12 and 14

in Japan (Tokyo).⁶ The high prevalence of myopia in school children is a major issue of school health and public hygiene in Asian countries.

The causes of myopia are thought to be related to genetic factors and the environment. It has been reported that seeing objects at a short distance for long hours during the growth period can affect the prolongation of the axial length of the eye, indicating that the use of mobile games and SNS could progress myopia; therefore, attention needs to be paid to lifestyles. Meanwhile, there is another survey of Chinese elementary school and junior high school children that reported that tasks performed at a short sight distance had no influence on myopia while a longer time of participation in outdoor activities was associated with a lower incidence of myopia in elementary school children.⁵ Moreover, it has been confirmed that increasing the time for outdoor activities at schools reduced myopia. Increasing the time for outdoor activities is not only good for eye health but also expected to be effective in preventing lifestyle diseases including obesity, and therefore, it is a good effort in school health.⁷ However, in Southeast Asian countries including Cambodia, where sunlight is strong and temperatures are high, it is difficult to increase the time for outdoor activities and some consideration is needed.

c. Astigmatism

Astigmatism is a condition in which parallel rays are not focused at a single point on the retina. This is caused primarily by an unequal curvature, instead of a spherical surface, of the cornea. In astigmatism, how objects are seen is different from, and more complicated than that in myopia and hyperopia. Objects look blurred regardless of the distance.

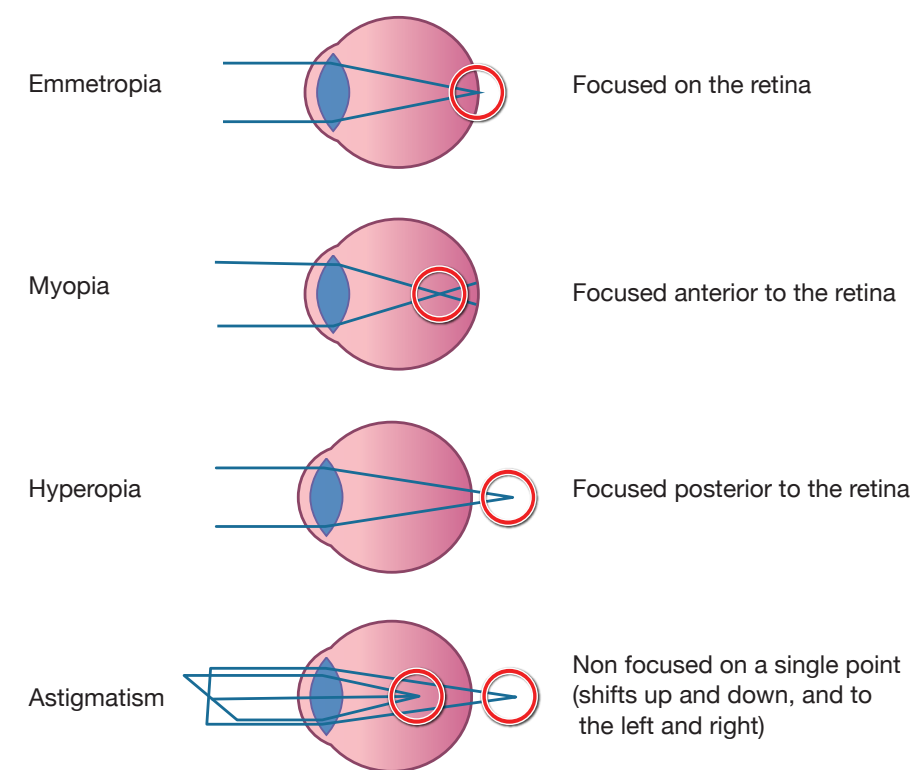


Figure 8.2 Emmetropia and refractive errors

4) Correction of refractive errors

(1) Glasses

Glasses are used to correct refractive errors. There are the two types of lenses for glasses: a **convex lens** and a **concave lens**. The convex lens is used in a magnifying glass, and its shape is round in the center and tapered in thickness toward the periphery. Meanwhile, the concave lens is thin in the center and thickens toward the periphery.

Since myopia is a condition in which rays converge anterior to the retina, **glasses with concave lenses are used**. The concave lenses converge rays posteriorly, thus adjusting the focal point to focus the image on the retina. **In hyperopia, meanwhile, rays converge posterior to the retina, glasses with convex lenses are used**. The convex lenses converge rays anterior to focus the image on the retina, making it possible to see the object clearly (Figure 8.3).

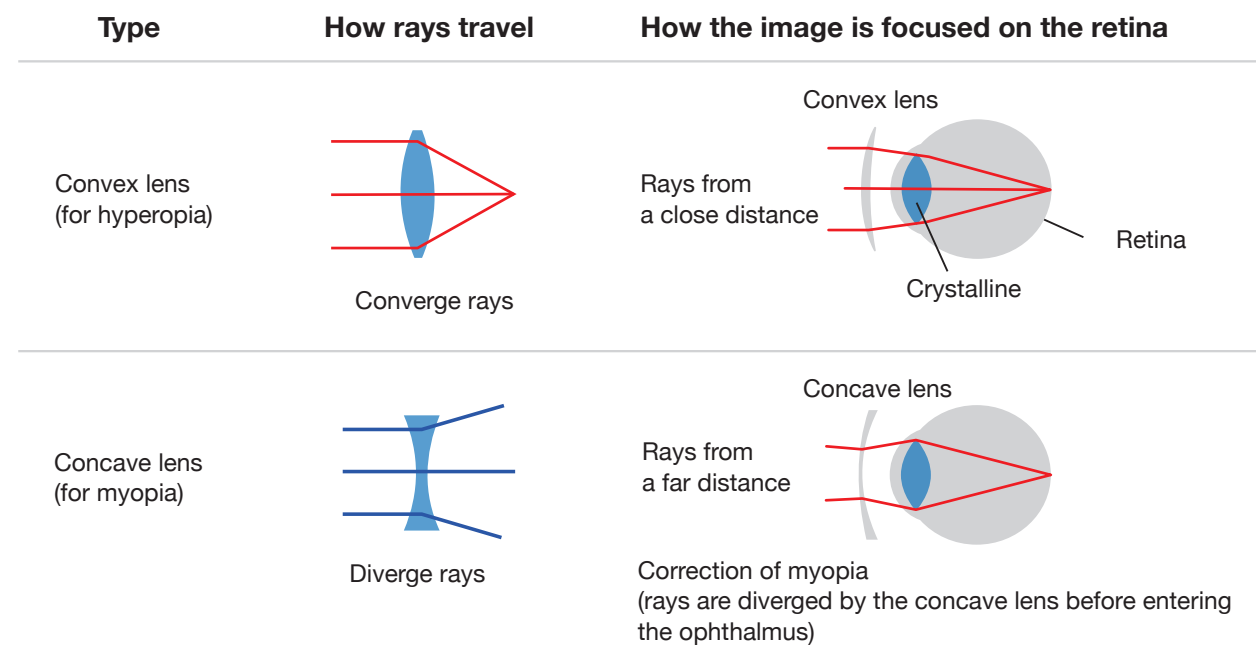


Figure 8.3 Mechanisms of visual correction by glasses

(2) Contact lens

A contact lens, which is a **medical device** placed directly on the cornea, can be used for various eye disorders, including myopia (nearsightedness), hyperopia (farsightedness), astigmatism, and presbyopia (poor focusing with reading material and other near vision tasks occurring typically in middle and old age). According to the material, it can be divided into hard contact lenses and soft contact lenses. The hard contact lens is made of a hard material and generally used for a long period while receiving maintenance such as cleaning. The soft contact lens is made of a material that softens with water and comes in different types: a single-use type, a type that is replaced every two weeks to one month, and a type that is used for a long period of time. The soft contact lens is slightly less effective in correction than the hard contact lens but has the advantages of giving the wearer a less uncomfortable feeling and causing less slipping and dropping.

In both types of contact lenses, attention needs to be paid to complications that may be caused by putting the lens on the surface of the cornea. Such complications include **corneal infection**, which is caused by damaging the cornea, **conjunctivitis**, which is caused by allergens attached to the contact lens, and **corneal epithelium disorder**, which is caused by decreased oxygen supply to the surface layer of the cornea that is covered. To reduce these complications, it is important to properly manage and use contact lenses. First of all, pay attention to how many hours per day. Depending on the type of lens and the condition of the wearer's eye, generally 12 to 16 hours per day is seen as a guide. Second, contact lenses should be kept clean, and contact lenses other than single-use lenses should be cleaned after use and stored in a clean container. Also important is having an eye examination at an ophthalmological clinic on a regular basis.

Column Fashionable contact lenses caused eye disorders!!

These days, some people use contact lenses not for visual correction but for fashion. They use colored contact lenses to change the color of the iris as well as circle contact lenses to make the pupil look larger. As with contact lenses for visual correction, contact lenses for fashion may also cause eye diseases if they are not properly used. Some people developed an eye disease by sleeping while wearing contact lenses, or borrowing/lending contact lenses from/to a friend. Avoid careless use, adhere to the same usage hours, and properly maintain the lenses. In addition, take care not to purchase inferior goods that use harmful substances to color the lenses. The abnormality of the eye or an uncomfortable feeling that people experience while wearing colored contact lenses is a sign of trouble in the eye.

5) Protecting your eyes

Because myopia often occurs during school age, the prevention of myopia is discussed here. Preventing the onset and progression of myopia can lead to the prevention of visual impairment in adulthood. The progression of myopia due to “environmental factors” can be prevented by reviewing daily life.

(1) Posture

It is said that sitting in a bad posture during class, or watching television or reading books while lying can exacerbate myopia. Pay attention to posture during class. Sit straight up, and allow a fist-size space between the desk and the belly. It is desirable that the height of the chair allow the bottoms of the feet to reach the floor entirely. If that is not possible, adjust the height of the chair or use a stool (Figure 8.4).

(2) Brightness

Classrooms and equivalent facilities require a brightness of 300 lux or more. Vertical TV and computer monitors should ideally give off 500–1000 lux (lux is a standard unit of measurement of light level intensity). In Japan, the “School environmental hygiene standards for environment of classrooms, etc.” stipulate that when classrooms are used for learning, they are required to have a brightness of 300 lux or

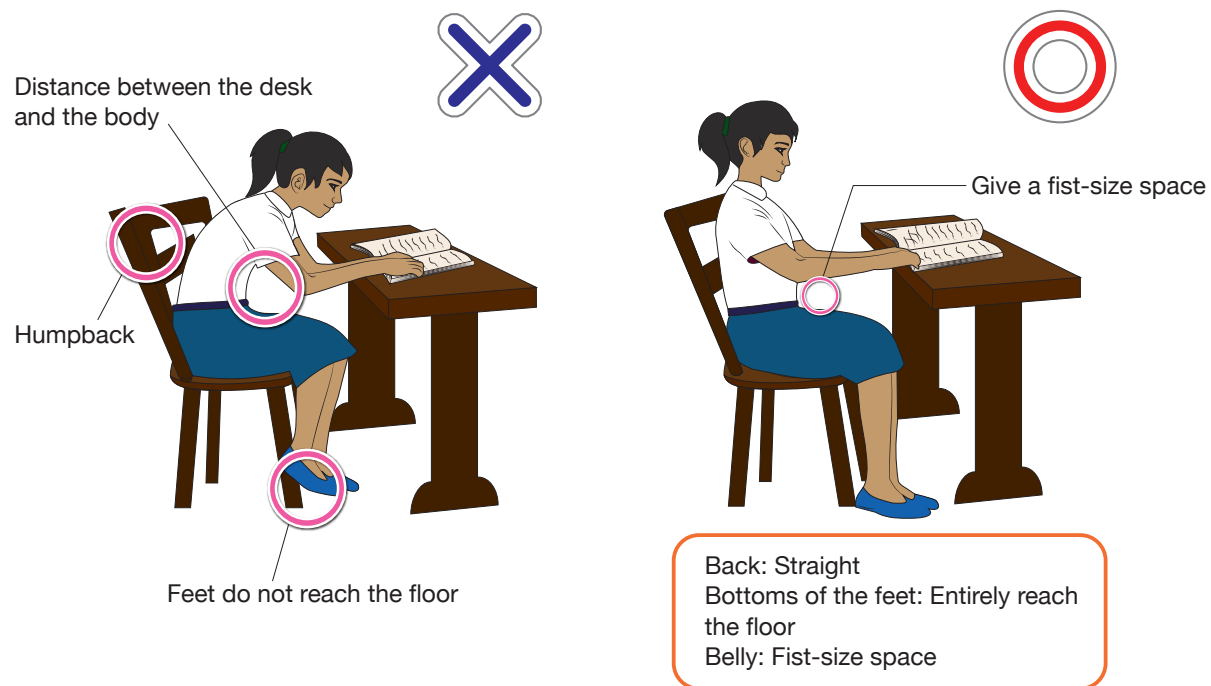


Figure 8.4 Bad posture and good posture during class

more for the entire classroom and a brightness of 500 lux or more for the blackboard surface.⁸

During class, students repeatedly look at the blackboard, a book, and a notebook. Therefore, a large difference between the brightness of the blackboard and that of the classroom causes eyestrain. In addition, attention should be paid to any direct sunlight from the window or a light source that interferes with the field of vision, as it can disturb visibility even if the intensity of illumination meets the standards.

(3) Rest eyes frequently

Staring at a close object for long hours will keep the ciliary muscle tense and likely exacerbate myopia. Recently, there have been increasing opportunities to look at small screens of devices such as smartphones and tablets. Small letters and screens make us particularly short-sighted and are likely to cause eyestrain; it is important to deliberately look away from the screen and look into the far distance to rest the eyes.

The American Optometric Association (AOA) recommends that **the 20-20-20 rule** should be followed in order to prevent eyestrain caused by continuing to stare computers or smartphone screens in particular. The rule is to take at least a 20-second break to view something 20 feet (approx. 6 meters) away every 20 minutes.⁹

2. Dental health

1) The roles and development of teeth

The functions of the teeth and the mouth are significantly related to vital functions including “eating,” “talking,” “creating expressions,” and “supporting movement and keeping a body in balance.”¹⁰ Among

these, the functions of “eating” and “talking” that are acquired in infancy as the teeth and the mouth develop are fulfilled by keeping those functions healthy throughout life. Therefore, keeping the teeth and the mouth healthy will improve the person’s quality of life (QOL) throughout their life. Although QOL can be interpreted variously depending on context, one popular understanding is that QOL represents the extent to which a person obtains satisfaction from life.

The number of teeth is 20 for milk teeth or deciduous teeth and 32 for permanent teeth. However, eruption of the third molars (the wisdom teeth) varies among individuals. Without the third molars, the number is 28. At around six months after birth, babies start teething with milk teeth and finish when they are around two and a half to three years old. The order of teething varies among individuals. The first permanent tooth to grow is often a mandibular central incisor or a mandibular first molar. Teething of permanent teeth is completed at 12 to 13 years old, with variations in the order of teething among individuals greater than those for milk teeth. Childhood is a period in which milk teeth are replaced by permanent teeth (Figure 8.5).¹¹ Because dental caries may affect how permanent teeth grow as well as the tooth alignment, childhood is viewed as an important period also from the standpoint of developing the characteristics, alignment, and occlusion of permanent teeth.

Individual teeth have shapes suitable for their roles concerning the function of eating. **Incisors** cut foods. **Canines** play a role in tearing foods into pieces. **Molars** play a role in grinding foods to change their shapes so that they can be easily swallowed. A tooth is comprised of the outside of very hard enamel, the body of dentine, and the root surface of cementum (Figure 8.6).

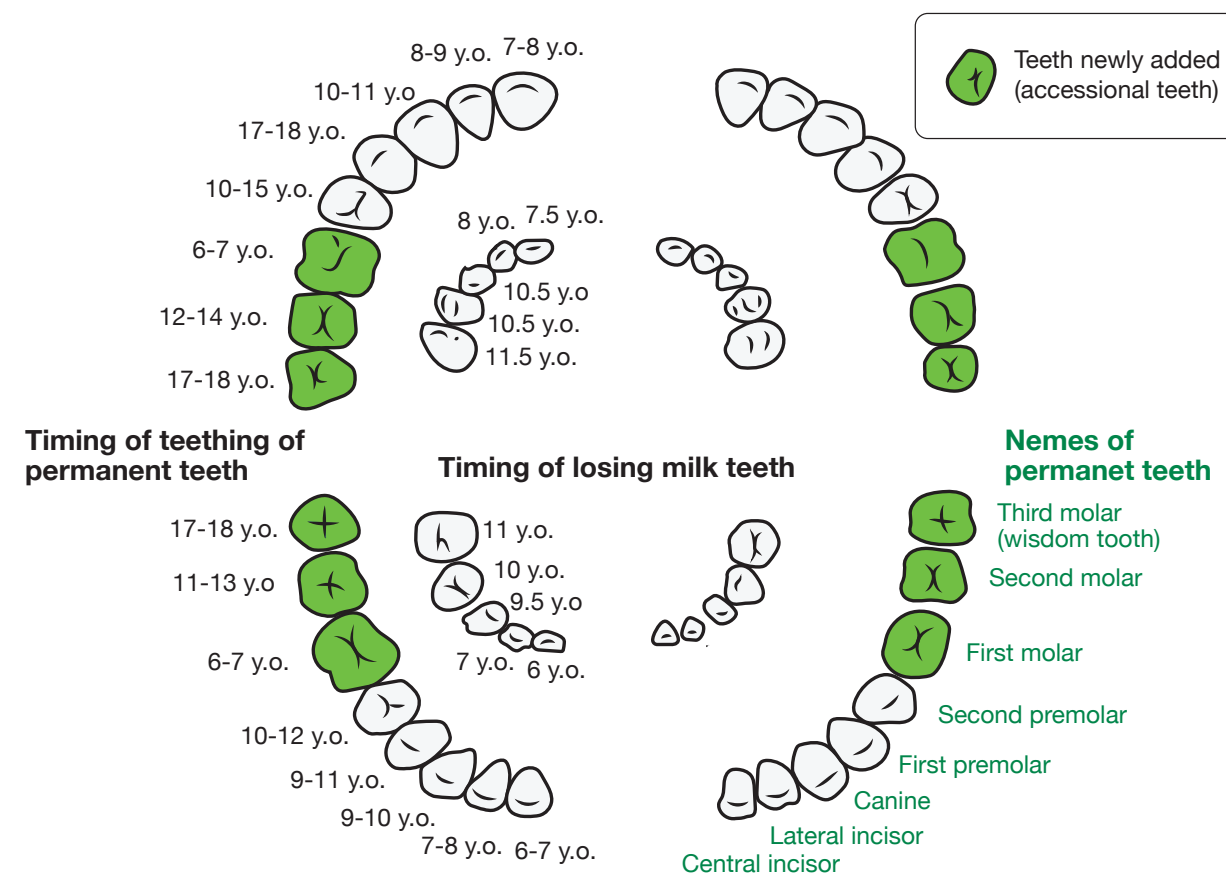


Figure 8.5 Timing of losing milk teeth and timing of teething of permanent teeth¹¹

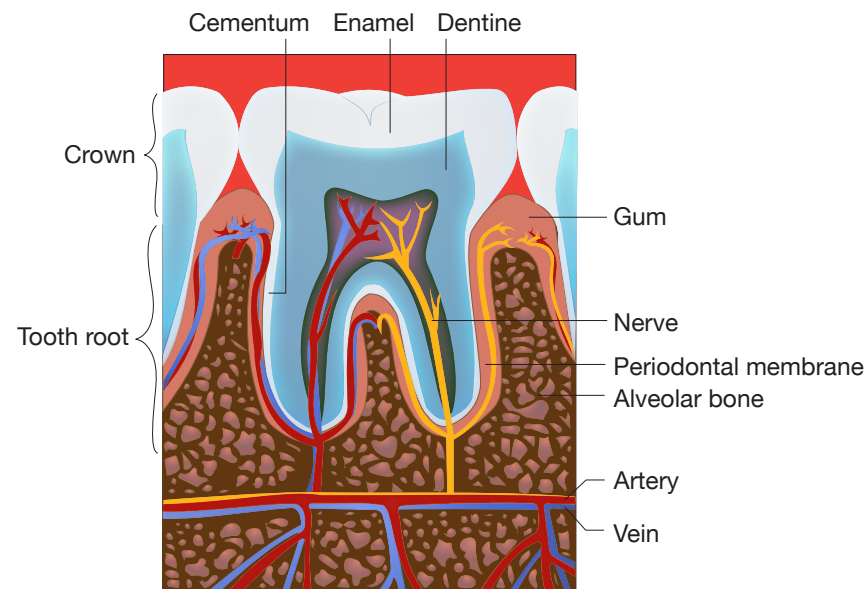


Figure 8.6 Structure of a tooth

2) Dental caries

Dental caries is a disease in which enamel or dentine is destroyed by acid produced by the activity of bacteria (mutans streptococci) and lactic acid bacteria in the mouth (see Chapter 4). Dental caries does not heal on its own, nor does a tooth with caries return to the original health even if it is treated. The Cambodia National Oral Health Survey, conducted in 2011, reported that the prevalence of dental caries is 93% for children aged six, and 80% for those aged 12 and 13 and aged between 35 to 44, indicating that dental caries is a major health issue not only for children but also for adults in Cambodia.¹²

(1) Mechanism of the development and progression of dental caries

Dental caries develops when the conditions of three factors, that is, bacteria, tooth quality/shape, and carbohydrate (sucrose or sugar) are met, and time passes. Described below is the mechanism of the development of dental caries (Figure 8.7).

- (i) Infection with **mutans streptococci** (formal name: *Streptococcus mutans*) is established.
- (ii) Mutans streptococci in the oral cavity uses carbohydrate taken as food to produce sticky glucan from sucrose. The glucan attaches to the surface of the tooth and produces plaque (see Chapter 4) with other oral bacteria. Thus, the plaque is an aggregate of various bacteria.
- (iii) Bacteria in the plaque further proliferate to produce acids using carbohydrates (sucrose) taken as food.
- (iv) When acidity in the plaque becomes $\text{pH} \leq 5.5$, enamel on the tooth surface begins to decay (**decalcification**; the dissolution of calcium and phosphoric acid from the enamel of the teeth).
- (v) Acidity in the plaque returns to the original pH level thanks largely to the effect of saliva, causing remineralization (restoration by the activity of saliva).
- (vi) Eating foods containing saccharides without a break leads to the disruption of the balance between (iv) and (v), which makes decalcification greater than restoration, resulting in dental

caries.

- (vii) Dental caries starts in enamel. Dental caries developed in enamel does not cause symptoms such as toothache or a pain sensitive to cold water or sweet foods. If left untreated, dental caries extends to dentine and the dental pulp (nerve). If dental caries extends to the dental pulp, a severe pain develops. Leaving this condition untreated results in the death of the nerve, and dissipation of the pain. Further progression of dental caries causes the crown to collapse and leaves only the tooth root. Because conservative treatment is impossible for this condition of a tooth, the tooth will be extracted.

Memo: Sucrose and sugar

Sucrose is the most common food sweetener. Industrial products mainly composed of sucrose are collectively called sugar.

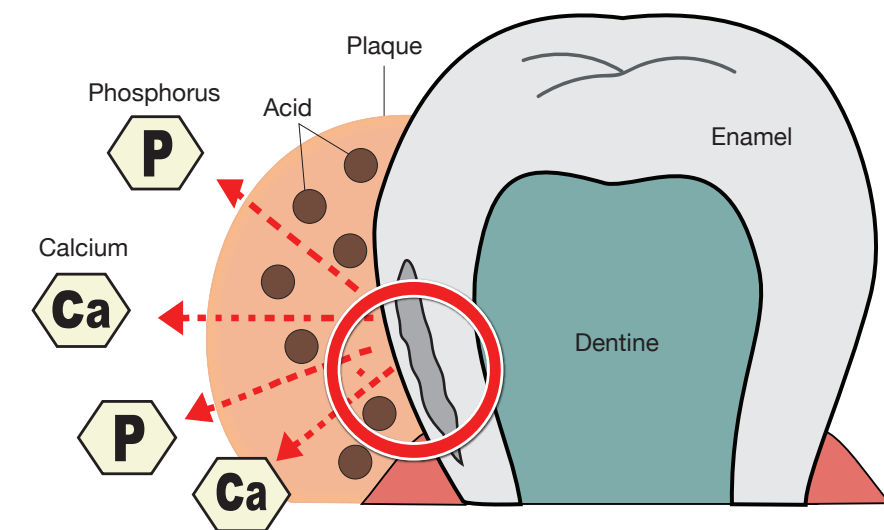


Figure 8.7 Mechanism of the development of dental caries

There are teeth and regions that are likely to cause dental caries. Among milk teeth, maxillary deciduous incisors as well as maxillary and mandibular deciduous molars are susceptible to dental caries. Among permanent teeth, the maxillary molar region is the most susceptible to dental caries. The regions that are likely to cause dental caries are grooves in molars, gaps between the teeth, and boundaries between the tooth and the gum (Figure 8.8). In these regions, food particles tend to remain and the cleaning effect of saliva is difficult to reach physically. Thus, the adhesion of **plaque** (see Chapter 4) is likely to occur.

In addition, newly grown teeth are likely to develop dental caries. When a tooth comes in contact with saliva, enamel absorbs calcium in the saliva to promote the crystallization of enamel, thus making the tooth resistant to dental caries. But this is said to take two to four years in general. Given that permanent teeth start to grow at six years old and complete growth by 12 or 13 years old, the school age is a period in which the development of dental caries is rather common. This is also a reason why establishing dental and oral health practice is necessary during school age.¹⁰

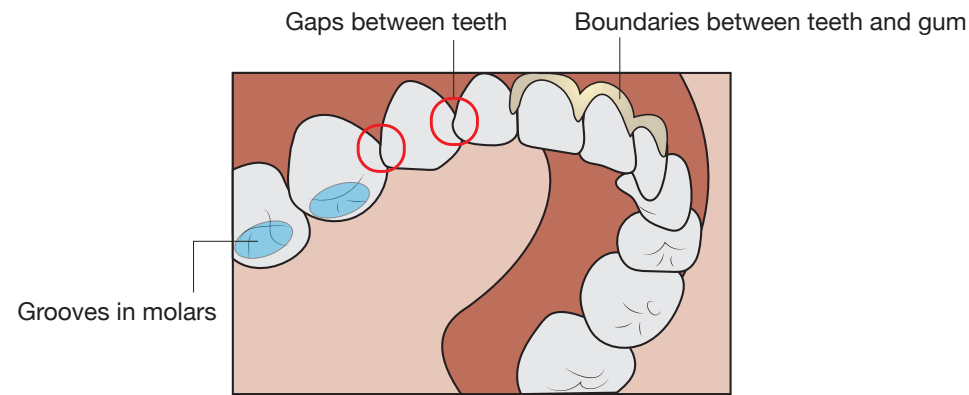


Figure 8.8 Regions that are susceptible to dental caries

3) Gingivitis and periodontal disease

Periodontal disease is a general term for conditions where periodontal disease bacteria have caused inflammation of the periodontia around the tooth (e.g., the gum, periodontal membrane, alveolar bone, and cementum). The condition in which inflammation is only caused in the gum is called **gingivitis**, and the condition in which inflammation extends to the alveolar bone and the periodontal membrane is called **periodontitis**. Having no subjective symptoms, gingivitis is often left untreated and progresses silently. By the time the disease is noticed, even the alveolar bone supporting the tooth has decayed due to a toxin from periodontal disease bacteria and inflammation. This is called the resorption of the alveolar bone, and in this condition, the tooth is wobbly, chewing foods becomes difficult, and eventually the tooth comes out.

Inflammation of the gum is caused by plaque that attaches to the boundary between the tooth and the gum and then increases. Plaque is an aggregate of various types of bacteria, and periodontal disease bacteria in particular, which like places where the amount of oxygen is small, enter the space between the tooth and the gum (a **periodontal pocket**) and destroy periodontal tissues with a toxin and acid (see Chapter 4). While periodontal disease affects many adults, gingivitis starts during elementary and junior high school age. Adolescent hormonal imbalance (particularly, changes in female hormone levels), stress, lifestyle habits such as smoking, and lifestyle diseases including diabetes are risk factors that can exacerbate periodontal disease.

Column: Causes and prevention of bad breath

Bad breath is a very common issue of oral hygiene. In most cases, causes are in the mouth; the two major causes are coating of the tongue and periodontal disease. Bad breath is caused by systemic diseases (metabolic diseases) such as diabetes, uremia, hepatic cirrhosis, liver cancer, and trimethylaminuria.¹³ The best way of making sure you do not have bad breath is to keep your teeth, tongue, and mouth clean. Preventive measures include twice-a-day gentle, careful brushing of the teeth, the gum, and the tongue, removing food particles from the space between the teeth, not smoking, and not taking in high-sugar drinks.¹⁴

4) Prevention of dental caries and periodontal disease¹⁰

The school age is a period in which milk teeth are replaced by permanent teeth and a lifestyle is established. It is therefore important to learn dental and oral health during school age. Establishing dental and oral health practice is a daily, common subject, in which it is easy to find challenges and see the process of solving such challenges. For this reason, dental and oral health is a valuable teaching and learning matter that enables the direct observation of the body condition and its changes. Here, brushing teeth and diet are discussed as preventive measures against dental caries and periodontal disease.

(1) Toothbrushing

Toothbrushing is effective in removing plaque (an aggregate of living bacteria) that can cause dental caries and periodontal disease. Plaque is milk white, a color similar to that of a tooth, and rough when it is tongued (see Chapter 4). Plaque tends to attach to gaps between the teeth, boundaries between the tooth and the gum, and the occlusal surface. Therefore, brush the teeth along the tooth alignment by brushing one area at least 20 times and keeping the following three tips in mind: (i) **properly place** bristle ends of the toothbrush against the boundary between the tooth and the gum as well as gaps between the teeth, (ii) **move it with light force** that does not allow bristle ends of the toothbrush to broaden, and (iii) **wiggle the toothbrush** within a range from approximately 5 to 10 mm, and **brush one by one** (Figure 8.9). Brushing the teeth in a predefined order will enable uniform, complete brushing.

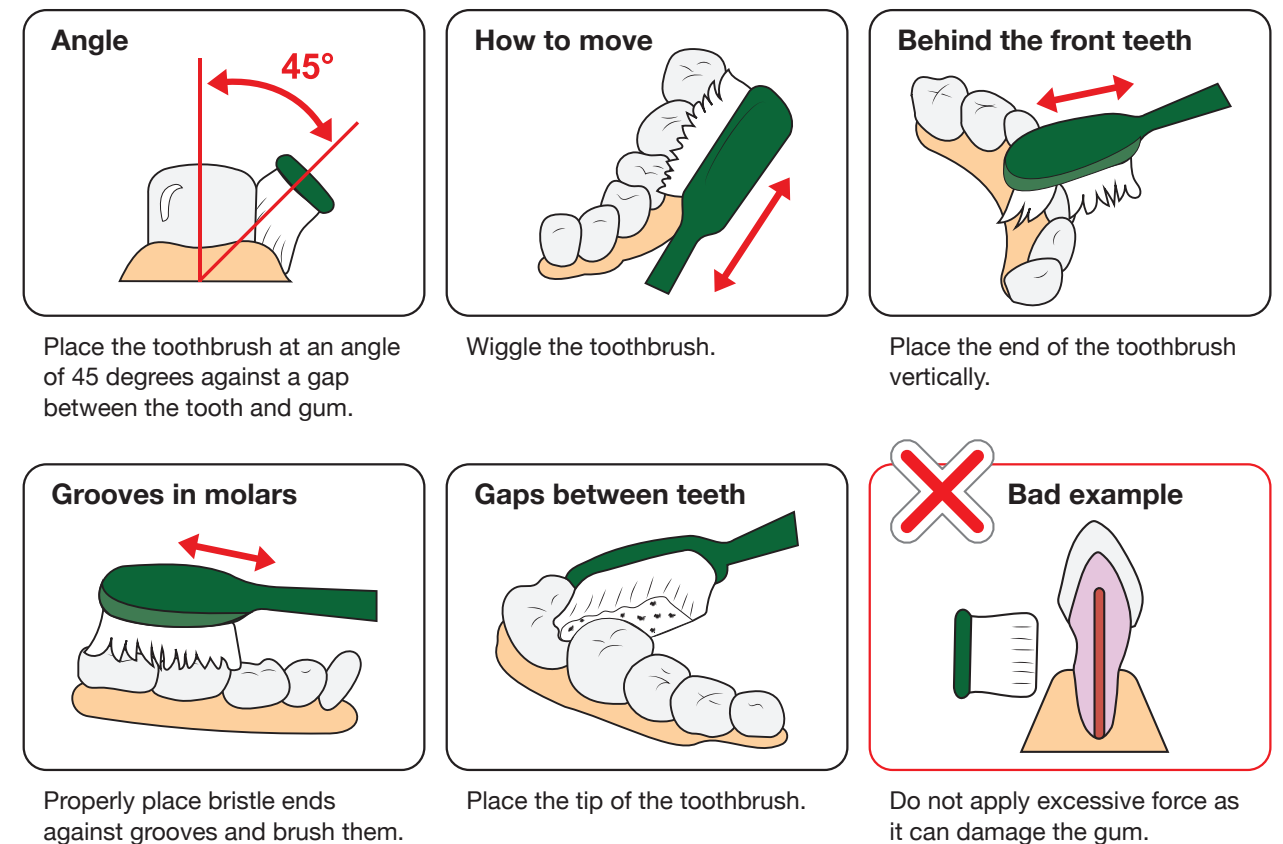


Figure 8.9 How to use a toothbrush

Make it a rule to brush the teeth after eating breakfast, lunch, and dinner in order to prevent the acid state of the oral cavity from lasting for a long time after meal ((iii), (iv), and (v) in the development and progression of dental caries described above). Brush the teeth particularly carefully before going to bed because, while sleeping, the amount of saliva secretion becomes small and the self-cleaning function decreases.

Column: A variety of toothpaste

What kind of toothpaste do you use? What standard do you apply to choose it?

Toothpaste contains various components. They include a polishing agent to remove stains (calcium carbonate, sodium bicarbonate), a refrigerant like mint, a forming agent to improve the feeling of brushing, and fluoride to prevent dental caries (sodium fluoride, sodium monofluorophosphate). It is only fluoride that has been shown to be effective in scientific studies. Although the foam of toothpaste makes us feel the teeth have been cleaned, foaming agents are not effective in preventing dental caries. The most important thing to prevent dental caries is to brush the teeth properly. It is recommended that you should start brushing without toothpaste and finish brushing with toothpaste. When you use toothpaste containing fluoride, it is also important to keep gargling to a minimum in order to allow the component to spread over and coat the teeth.

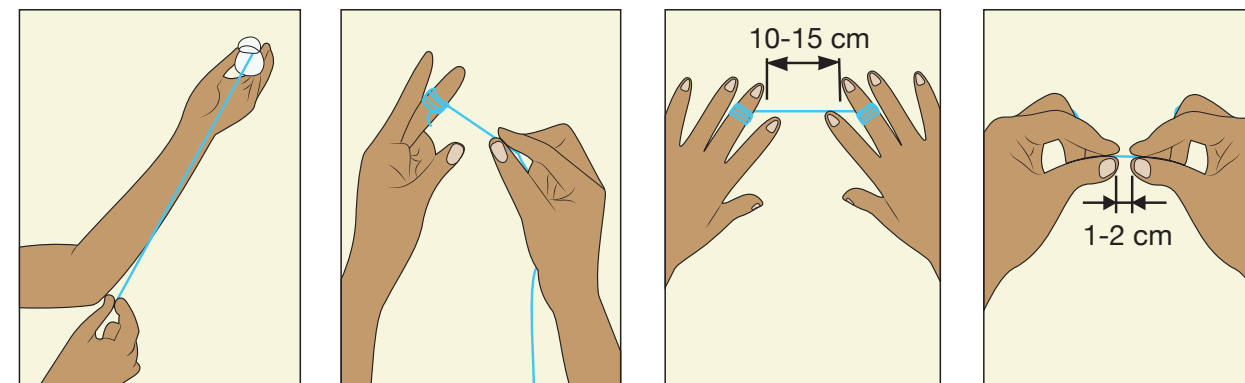
(2) Dental floss

It is difficult to remove plaque between the teeth with a toothbrush because bristle ends do not always reach between teeth. **Dental floss** is made of thin bundled fiber (Figure 8.10). This allows it to pass through a narrow gap between the teeth to scrape off plaque that cannot be completely removed with a toothbrush. Figure 8.11 shows the proper method for using dental floss.

Dental floss comes in two types: wax type and non-wax type. The wax type slides well and is easy to insert into gaps between the teeth; it is thus recommended for novice users. The non-wax type can scrape off plaque more efficiently because its fiber is not fixed with wax and thus can fit the surface of a tooth when it sticks to it.



Figure 8.10 Example of dental floss



Cut floss to a length of about 40 cm (length from a fingertip to the elbow).

Wind floss around both middle fingers (forefingers) several turns lightly. Wind a longer section around your non-dominant hand.

Adjust floss to make the space between both middle fingers 10-15 cm when floss is taut.

Hold floss with thumbs and forefingers and handle it while keeping a space of 1-2 cm.

Figure 8.11 How to hold dental floss

Let's experiment Experiment for effective toothbrushing

Preparation: Plaque disclosing tablets, toothbrush, mirror, cotton swab, towel, clothespin, water bottle (water for gargling), container to spit out water, etc.

Experimental method (Figure 8.12)

- (i) Put a towel around your neck and fix it with a clothespin.
- (ii) Brush your teeth.
- (iii) Chew one plaque disclosing tablet firmly into small pieces. Apply them to your teeth with your tongue with the aid of a mirror, then spit them out.
- (iv) Rinse out your mouth one or two times.
- (v) Observe areas that have been stained red in the mirror.
- (vi) Discuss regions that tend to remain uncleaned.



Figure 8.12 Staining experiment steps

(3) Eating habits to maintain dental health (how and what to eat between meals)

Among carbohydrates, sucrose (sugar) can be a primary cause of dental caries because “it is used as a material to produce plaque” and “it is used as a material for acid production by bacteria.” At the same time, sucrose is an important nutrient source. Therefore, the important thing is not just cutting the intake of sucrose but taking it in a wise way. Specifically, it is important not to take foods containing it frequently

or irregularly (not to eat without a break) because the constant presence of sugar in the oral cavity creates an environment in which acid is constantly produced and thus decalcification progresses (Figure 8.13). In addition, eating sticky foods such as snack foods should be discouraged because carbohydrates persistently remain in grooves in molars, which is a condition that is likely to cause dental caries.

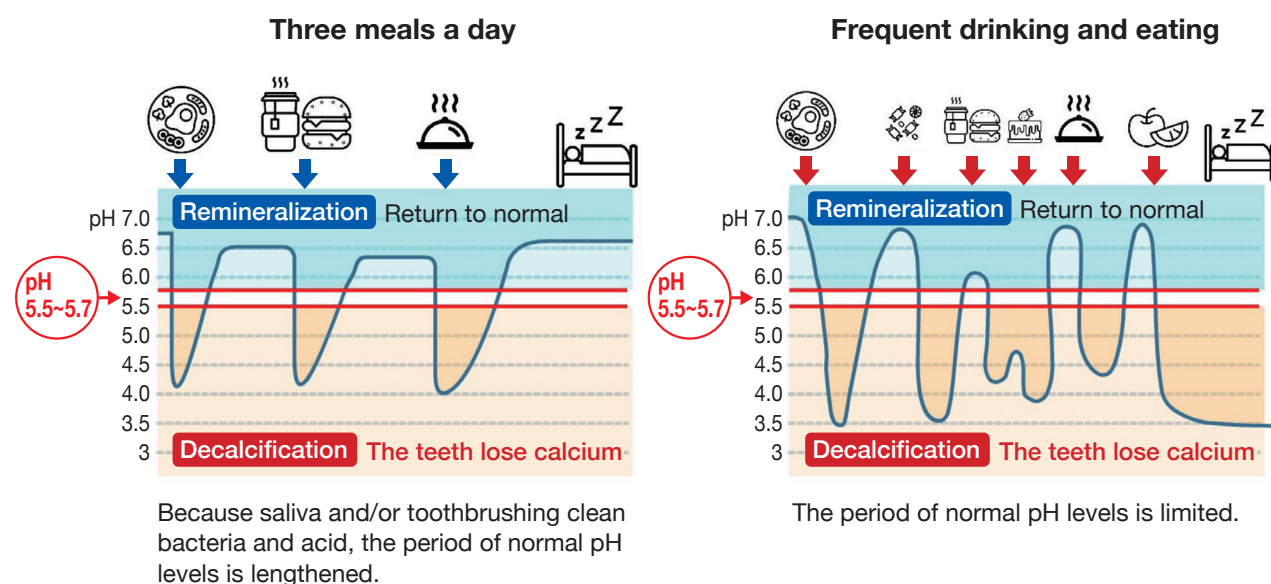


Figure 8.13 Relationship between diet and oral cavity pH (Stephan curve)

Exercises for further thought and research

- [8-1] The prevalence of myopia among school children is said to be lower in Cambodia than in other Asian countries. Find reasons for that. Predict whether or not the number of children with myopia will increase in the future by sharing views.
- [8-2] Assume that you give an eye health class to elementary school students, consider the content and method, and give a mock class.
- [8-3] It is difficult to increase time for outdoor activities in Southeast Asian countries including Cambodia, where the sunlight is strong and temperatures are high. Consider what kinds of measures can be taken to increase time for outdoor activities for children.
- [8-4] Investigate the habit of toothbrushing among elementary school students. Consider benefits and challenges based on the section of “Toothbrushing.”
- [8-5] Consider an effective method for teaching toothbrushing taking into account ages at which teeth are replaced by new growth.

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