# CHAPTER II

## LITERATURE REVIEW

This is a cross-sectional survey research, aimed to study the levels of preventive and control behaviors against Dengue Hemorrhagic Fever (DHF) of the primary school children at Chulaporn District, Nakhon Si Thammarat Province and the relationship among the following predisposing factors (socio–demographics); age, grade level, gender, socio–demographics of their parents regarding their education level, occupation, knowledge of DHF, attitude towards DHF, enabling factors (parent's income, the sufficiency of resources), reinforcing factors (social support from teachers, parents). The review of literature consists of the following topics:

1. Knowledge regarding Dengue Hemorrhagic Fever
2. Prevention and control measures for dengue haemorrhagic fever
3. Health behaviors and prevention behavior
4. PRECEDE framework & social support
5. Related research

# 1. General Knowledge Concerning Dengue Hemorrhagic Fever (DHF)

Dengue Haemorrhagic Fever (DHF) is a severe disease caused by the Dengue viruses. Aedes aegypti, a daytime biting mosquito, is the principal vector. It was originally found in Thailand during the period of 1949 through 1950. The majority of the people in the infected group are children. At that time, the disease was diagnosed as "influenza with bleeding". In 1954, an epidemic disease similar to the one found in Bangkok was reported in the Philippines.

The disease was not diagnosed as DHF until it re-emerged in 1996. The dengue virus was classified by Dr. William McDonald and his team from Pittsburgh University, USA (Division of General Communicable Diseases, 1998.) The disease was first reported in Thailand in 1987. The severity of DHF is different and more severe than Dengue fever (DF). The World Health Organization (WHO) classified the Dengue syndrome as if the patient had severe symptoms with shock, it may be called Dengue Shock Syndrome (DSS).

### Cause and epidemic of the disease

2 types of viral agents cause the disease. The most common type is the Dengue virus, which infected 87% of the patients, and the other is Chikungunya. Dengue is an RNA virus, which is classified in the Flaviviridae Family (originally a Group B arbovirus). It has four serotypes, DEN 1-4 that includes some mutual antigen causes of cross-reaction and presents instant cross protection. Permanent immunity will arise after being infected by each stereotype, and partial immunity towards the other three

dengue viruses present within approximately 6 –12 months. After that, a secondary dengue infection, the principal factor of dengue fever, will occur.

The study of DHF at Children's Hospital and the viral section of AFRIMS, found that 85-95% of the patient with DHF revealed a re-infection, while the primary dengue infection usually occurred in children below 1 year of age. It can be summarized that the principal factors causing DHF has more than 1 type (simultaneously endemic of multiple serotypes) or the epidemic may occur in sequence (sequential epidemic). DEN-2 re-infected cases can be seen in densely populated, and are at a high risk of becoming the DHF disease (Division of General Communicable Diseases, 1998)

**Host**

At present host is only found in human beings.

**Environment of Vector**

As DHF is an Arthropod bone disease caused by the Aedes mosquito, the environment has a vital relationship between the population of the Aedes mosquito and their breeding sites.

**Time**

This disease can occur throughout the year, particularly in big towns, however, it is usually found during the rainy season. The reason for this epidemic may be due to the increasing number of breeding sites, or it may be that the temperature and humidity

in the rainy season impacted the bite rate or the life cycle of the mosquito. In addition, the mosquito may have more of a chance to bite children as they spent more daytime hours at home in the rainy season (Division of General Communicable Diseases, 1998.) The number of patients will increase during the period of April through May and the highest rates were recognized during July or August. Afterwards, the rate will continuously decline until cases are again found in December (Division of Epidemiology, 1987-1997.)

**Age**

Children between the ages of 5-9 years of age make up the majority group, followed by 10-14 year-olds, and finally, younger than 5 years of age. The number of patients who are younger than 1 year old, 1-4 years old, and 5-9 years old was seen in comparable proportions during the last one to two decades and the figures for adult patients were found minimally. However, the school age child between 5-14 years of age was found to be the majority group of patient at this time. The mortality rate in a young age group is higher than the adult group.

**Gender**

The division between female and male patient is nearly equal, however, female were reported as having a more severe cases and died from the disease more often than men (Veerawit Boonyapisit, 1988: 265 – 306.)

**Location**

Presently, the DHF epidemic is found in almost all villages of all provinces

throughout Thailand. The proportion of the prevalence rate between urban and rural areas is incomparable. The incidence rate was found to be comparable in each region if that year had a low pandemic rate and increased in some regions in high outbreak years. Data from epidemiology from 1990 to the present, revealed the incidence rate in the northern region showed an increase almost every year. (Division of Communicable Disease Control, 1997)

**Mode of transmission**

Transmission occurs when the female Aedes mosquito sucks blood from a DHF patient, then the virus goes into the stomach of the mosquito and ferments in the stomach wall before increasing in number and finally it spreads through the salivary gland. Whenever the infected mosquito bites a person, the dengue virus from the mosquito will be emitted into the human bloodstream and multiplies to cause the disease in that person. The incubation period of the disease in the mosquito is around 8-12 days and it is permanently infected for their lifetime (approximately 1-2 months). This disease can be transferred to humans each time bitten. The incubation period of the disease in human is around 3-15 days and approximately 5-8 days for the ones who were previously infected by the disease.

**Signs and Symptoms**

**1. Febrile phase**

The patient will show an acute high fever that may be as high as 38 to 40 degrees Celsius. The most common symptoms are: flushed face, headache, and myalgia including a high fever, which persisted for 2 to 7 days. Bleeding is frequently found in

the petechiae of the skin on the arms or legs, in the armpits, or over the trunk. A Tourniquet test showed positive from the first day of the infection. Severe bleeding is seen in the stomach and intestines. The patient will show vomiting with brown colored blood or black feces, pain in the abdomen or xiphoid or pain in the right false rib due to hepatomegaly.

**2. Shock or Hemorrhage**

In some severe cases, the patient's condition suddenly deteriorates a few days after the onset of fever. A rapid drop of temperature, between three and four days after the onset, the early stage of shock is characterized by the skin becoming cool, circumoral cyanosis is frequently observed, and the pulse becomes weak and rapid. Although some patients may appear lethargic, they become restless and then rapidly go into a critical stage of shock with a minimal difference between systolic and diastolic blood pressure levels and the narrowing of pulse pressure (20 mmHg or less), cold clammy skin and restlessness, and origo urea can be present. Patients in shock are in danger of dieing within 24-48 hours if they do not get appropriate treatment promptly.

**3. Convalescence Stage**

In about 7-10 days after the onset of the disease, the convalescence of DHF will begin. The fever will disappear and most of the patients will recover within 2 to 3 days. The rash will usually be gone within two to four days and their appetite will return. A Tourniquet test might show positive for several more days.

### Treatment

An effective drug for battling the virus has not yet been initiated, and a preventive vaccine for DHF is still in the development stages (Division of Communicable Disease, Department of Disease Control, The Ministry of Public Health, 1998). Suppressive treatment is used for this disease. Early diagnosis leads to effective results of the treatment. The principal treatment for severe fever and myalgia is administering antipyretic drugs, such as Paracetamol, but the patient should be given aspirin, since it is harmful for platelet functions and easy bleeding. The drug should be given only for a short period of time, if necessary, and the patients should be given sufficient oral mineral salt (ORS) since dehydration of water and minerals usually occurs. Therefore, strict monitoring is necessary to prevent the symptoms of shock and the patient should be immediately sent to the hospital if vomiting, bloody feces or shock develops.

### Characteristics of the vector mosquito

Aedes aegypti is the principal carrier of the disease and Aedes albopictus is the secondary. The mosquito is medium sized with a black and white segmented body and legs. The ends of the back legs of this mosquito are entirely white. Complete metamorphosis is developed from the egg, to larva, to pupa, and finally the adult mosquito. The 4 stages are different in their characteristics and life support. A single mating is sufficient for lifelong fertilization of the egg, since the female mosquito can keep the sperm in her spermatheca and suck blood to develop the growth of the eggs in her ovaries. It can lay 100 eggs and is very resilient to dry weather for numerous months.

After hatching, the larva will molt 4 times and then become the pupa. One to two days after that, the pupa will become an adult. Each cycle depends on temperature, water, and food. With normal temperatures, the life cycle is around 7 to 10 days for the male and 30 to 45 days for the female. She can lay eggs 4 to 5 times in her lifetime. This is the reason the mosquito can rapidly increase the numbers of the mosquito population. Before laying her eggs, she frequently must suck blood and uses the protein in that blood for the development of those eggs.

**The Mosquito Breeding Areas**

The Aedes aegypti prefers to lay its eggs in clear still water; rainwater is its favorite place. Around the home, these might be found in containers, such as open containers of water stored for drinking or use in both inside and outside the house. From a survey of the bleeding containers it was found that 85.5% of the containers were inside the house and 35.53% outside. Besides the water containers, other possible breeding sites include: objects such as the saucer inside the food cupboard used to prevent ants, plant pots, flowerpots, stored water for foot cleaning, discarded tires, jars, soda and tin cans, stored water for animals, discarded objects, and coconut shells. The Aedes albopictus prefers to lay its eggs outside the house, in coconut husks, banana, lily, tuberous plants, objects used for collecting crepe rubber and sections of bamboo. The most common mosquito breeding sites in the schools are cement containers in the lavatory and flowerpots.

The General Communicable Disease Division's survey of mosquito breeding sites in each province of the country in 1990, revealed the following: 70.82% of the

Aedes breeding sites were in objects located both inside and outside the house, such as stored water for drinking and using, 15.68% were objects such as the saucer in the food cupboard used to prevent ants, and 13.49% were jars, oil tanks, flowerpots, and discarded tiles. The Aedes albopictus was found in the natural objects, such as the husk of plants and coconuts.

The study of Jitti Junsang (1993), revealed the majority of the bleeding sites were stored water jars, while objects such as the saucer in the food cupboard used to prevent ants and cement ponds were the least preventive sites for the Aedes mosquito. Thanom Marat (1984) and Nuanlaoa Wiwatworapan (1995) found that the most common objects containing breeding sites in the school was the flowerpots of the piper betel plant.

The random survey of the Aedes and its mosquito larva by village volunteers and public health officers in the health center of Chulaporn District (Chulaporn District Health Center Office, 2001) during the month of August, showed the most common breeding sites were the utensil water (25.5%), saucer under plant pots (18.6%), saucer in the food cupboard (16%), stored water for drinking (13.35%), and flowerpots (6.2%). The survey of schools found larva in saucer in the food cupboard (100%), stored water containers (51.6%), saucer under plants (34.85%), objects for storing drinking water (31.34%), and flowerpots (8.64%).

Somkieat Boonyabuncha and his team (1987) revealed the mosquito could be caught from various sites (66.5%). The most common site was clothesline inside the

house (this shows the nature of the mosquito is to most likely live in a dark and calm place). In summary, small amounts of water in open containers are preferred sites for laying eggs. Throughout the year breeding sites were found in the following percentages: 70-90% in saucer in the food, 30-40% found in stored water for drinking and use inside the house, the same percentages seen in other objects such as flowerpots, open jars, cans, and concrete cisterns in the lavatory. The rainy season is the most prevalent period where breeding sites were found.

## 2. Prevention and Control Measures for Dengue Hemorrhagic Fever

Factors related to the DHF disease consist of 3 components: disease, humans, and vector (mosquito). At present, a treatment for this virus has not been discovered, therefore, prevention and control measures for the spread of the disease is appropriate. Providing health education to people, along with decreasing and eliminating the breeding sites of the Aedes mosquito, is the principal strategy to be used. This model was set up based on community cooperation, however, central control by government organizations that create the plans, models, and guidelines for the practice is the methods used to control and eliminate these issues.

There are only two countries that were successful in using the regulation method, namely Singapore and Cuba. Following this implementation, houses found with larva in the breeding sites would be penalized. This strategy needs additional resources, such as sufficient officers, neutrality, and strict and equal actions. For this reason, other countries, including Thailand, that follow this implementation are

unsuccessful. Because of this failure, community-based cooperation has constantly become an cooperative concept on its effectiveness (Silom Jamutid, 1998).

According to the differences in the life cycle of each Aedes mosquito, control and prevention measures at each stage is also different. Integration and implementation are beneficial strategies needed to control and prevent breeding sites and the Aedes mosquito. Besides, each community should implement this model at the same time for constancy and regularity. This control and prevention model consists of either advance implementation or during the epidemic's crisis. The Ministry of Public Health offered the scheme and measurement to control and prevent the disease. The government agencies in each level have considered creating action plans of control and prevention depending on each circumstance of the areas and epidemic crisis. The present implementations are not complicated; people can manage them themselves without complex resources. The following can summarize the prevention and control of DHF:

**2.1 Eliminating or lessening of the breeding sites namely:**

2.1.1 Cover stored water for drinking and use containers with mosquito nets or plastic before covering with outer cover.

2.1.2 Invert unused containers to prevent the holding of water.

2.1.3 Burn, bury or conceal all waste objects that might become breeding sites.

Besides covering all objects, other methods to eliminate or lessen the breeding sites should be done regularly every 7 days throughout the year, especially in the rainy

season, to eradicate the whereabouts of the mosquito and to keep a healthy environment.

**2.2 Prevention and control for elimination of larva regarding:**

2.2.1 Physical control

Some documents have categorized these procedures as the same as eliminating or lessening the breeding sites. Physical control is the most simple to practice without either waste of the budget or high technology. However, the cooperation of each concerning group and regularly practicing entirely throughout the year, are the most effective approaches. The seven-day observation in each household can be accomplished by the following: getting rid of the larva from all breeding sites, covering the container objects, turn over, burying or demolishing all unused waste containers. The container that cannot be or are hard to cover should be cleaned or the water should be changed every 7 days. Besides changing water in the flowerpots, it should be clogged with a piece of tissue. The basin pots or others may be use scientific soil instead of water.

2.2.2 Biological control

Adding some hormones into water to impede the growth of the larva, such as Bacillus Tharingqiensis Var Israelnois (B.T.I.), or Toxorhynehites splendeus, revealed a problem in real practice in effectiveness and proof to the communities. The most effective approach, simple and safe to apply, would be to put fish that eat larva, namely the Libestes and Gambusia fish, into the container. This approach has some limitations in use due to people's behaviors by getting bored with the process and easy to disregard or dislike the fishy smell.

### 2.2.3 Chemical Control

Using abate sand granules that were guaranteed by the WHO for safety. This abate is appropriate for uncovered containers or those that cannot be controlled by physical or biological techniques. Abate should be used following the recommendations in the amount of 1 teaspoon per 100 liters of water (100 g. of Abate/100 liters of water). The larva will be killed within 1-2 hour. However, it did not effective on the pupa. The effectiveness of the Abate is 3 months and water needs to be added regularly. Therefore, every 1 to 3 months new Abate should be added if the water was frequently used. To make it simple to use for the communities, the proportion of water and Abate was calculated in amount of 1 teaspoon of the Abate per 1 red jar (100 liters), 2 teaspoons of the Abate per 1 earthen jar (160 liters), and 3 teaspoons of Abate per 1 cement earthen jar (240 liters).

However, it is very difficult to calculate the amount of water and Abate for other containers or if water is added frequently; therefore, the amount of water and frequency of use are the principal factors in consideration of the effectiveness of the Abate sand. Due to the confusion in calculating the appropriate amount of chemicals to use and the severe smell, it might be harmful for health if added in a more concentrated volume than the standards suggested by the WHO that has accepted Temephos in drinking water since 1971 and the Ministry of Public Health (MOPH) started to use Abate with the project for controlling DHF since 1972. The cost of the Abate is quite high and unavailable for purchase by individuals, therefore the issues of the lack of this chemical throughout the year even after it was promoted by the MOPH to every household and school.

Therefore, physical and biological techniques should be considered before using the Abate Sand. In small containers that store water, such as the saucer in the food cupboard used to prevent ants, the saucer under flowerpots or others, chemicals or mosquito prevention substances should be applied in appropriate proportions, such as ½-1 teaspoon of salt or 2 teaspoons of vinegar or ½ teaspoon of washing powder in the saucer in the food cupboard used to prevent ants (Bureau of Dengue Hemorrhagic Fever Prevention and Control, 1999). These will prevent the Aedes mosquito from laying their eggs. However, water must be changed and these substances used every month, otherwise an ant could walk on the film on the surface of the water. Also, putting hot water into the saucer in the food cupboards every 7 days might be done. If this technique did not work, resin, wood ashes, or unused motor oil can be used. For the saucer of flowerpots that hold water, sand should be added in the amount of 3 to 4 parts of the depth of the water to absorb the surplus water.

### 2.3 Adulticiding

Adulticiding are chemicals used to control or eliminate the larva or the use of traps. Space spray chemical use has 2 methods; ultra low volume or ULV, and thermal fogging, and both should be applied during the period of time that the Aedes mosquitoes search for their meals. The chemical spray will be used following 2 criteria. First, to control the epidemic in critical situations, a number of infected people were reported to have applied the chemical spray around the house in a range of 50-100 meters and if an onset occurs at the same time, get rid of the epidemic and cut off the cycle of the spreading disease.

The second, for advance prevention in the area of a frequently occurring epidemic only (Endemic area or high risk area), and is usually used to enhance the principal measurement that focuses on control of the Aedes breeding sites; it will be not used if the principal measurement is effective. The chemical spray is highly effective but has a short time of effectiveness and has many limitations, such as it has to be applied by a knowledgeable officer, the cost of the chemicals and equipment are high, and inappropriate application frequently will cause the mosquito to be come resistant to the chemical. One method to dispose of the mosquito is by using a trap, but it is not a very popular way.

**2.4 Lessening personal contact with the mosquito** (Man-Mosquito contact), means preventing being bitten by the mosquito, namely;

2.4.1 Avoiding mosquito bites by sleeping under a mosquito net or screened room, either regular or chemical net.

2.4.2 Applying anti-mosquito cream to prevent mosquito bites.

2.4.3 Applying herbal substance repellents, such as basil, citronella grasses, or plants a mozzei buster or zingiber cassumunar.

Prevention of DHF by lessening or destruction of Aedes breeding sites will become successful if integrated with several strategies and covering the entire community. Since it still has breeding sites in some households, the number of Aedes mosquitoes will increase slightly in number and if the Dengue disease persists, an epidemic of DHF might occur. Besides, the measurement must be continuously used and regularly practiced throughout the year in both communities and schools, because

those places are principal epidemic sites. Prevention and control of the disease by using chemical substance is effective but needs to be carefully applied and might cause problems because of an insufficient budget for the project, the same as biological control. So, an implementation plan should be set up appropriately for the community and conform to the epidemic situation.

**2.5 The survey and the prevalence indicator of Aedes** (Division of Communicable Disease Control, 1993)

The prevalence survey is principal and necessary since it indicates the changing level of the prevalence of Aedes in each season, and reveals the types and numbers of breeding sites in each area and easily can be used to plan the control or destruction of that mosquito's species and also indicates the effectiveness of each strategy.

The survey was divided into the following:

1. The survey for the prevalence of the Aedes larva; the preferred 2 surveys to collect the sample of Ae. Aegypti and Ae. Albopictus are:
    1.1 Single larval surveys are surveys used for collecting 1 larva per 1 object that was found to contain the larva. This method was used specifically for Ae. Aegypti and is usually used in urban or community areas that have the Ae. Aegypti vector. This is the principle technique used in Thailand, Brunei, Malaysia (both east and west regions), South Vietnam, and the Philippines.
    1.2 All larval surveys are the technique of collecting the entire sample of Ae. Aegypti and Ae. Albopictus in a container. This system is in popular use in Singapore.

The prevalent indices of the Aedes mosquito that is popularly used in interpreting the surveys are:

1. House Index (H.I.), the percentage of households that found the larva

$$\textbf{H.I.} = \frac{\textbf{Number of household found larva x 100}}{\textbf{Entire survey of houses}}$$

House Index is the roughest method in measuring the spread of the disease since it does not collect details on the contents of the containers, number of larva found, and mosquitoes that laid their eggs in the house found in that survey. However, this index can create a concept on the percentage of the houses that found the larva was found in and the population who are at risk of DHF.

2. Breteau Index (B.I.), the number of containers that found larva per 100 households

$$\textbf{B.I.} = \frac{\textbf{Number of containers that found larva x 100}}{\textbf{Entire survey of houses}}$$

Breteau Index is the best indices to estimate the Aedes mosquito's prevalence because it is the result of the number of container that larva was found in per 1 surveyed house. This index shows the real number of containers that has the larva in 1 household or an estimated number of containers in that area. If the number of the Aedes mosquito that grow in the containers was known, an epidemic disease in that area will be predicted (B.I. should less than 100).

3. Container Index (C.I.), the percentage of the containers that found the larva

Schools generally have difference condition than households, appropriate

indices for measuring the prevalence of the Aedes mosquito for controlling the disease in schools is the container index (C.I.); that means, the percentage of containers that were found to contain the larva (Tanom Marat et al, 1992). A C.I. higher than 20 per cent means that the schools or communities are at risk for DHF. The calculation method for C.I. is:

$$\text{C.I.} = \frac{\text{Number of containers that found larva x 100}}{\text{Entire survey of containers}}$$

4. Stegomyia Index (S.I.) is the number of containers that the larva was found in per 1,000 population.

$$\text{S.I.} = \frac{\text{Number of the containers that found larva x 100}}{\text{Number of population in the survey area}}$$

Stegomyia index is the relationship between the number of the containers and the population in that area. From this value, the number of the population at risk in being bitten by the mosquito that that grew from those containers can be determined. This is the best indicator to predict an epidemic of DHF.

In the survey, even if only one larva of each stage was found, that container is thought to be a breeding site for the Aedes mosquito. The container that was used as a breeding object must be one that stored water only.

The survey of larva in the school consists of C.I and S.I.

After the survey, the data will be collected including the indices and the prevalence. Afterward, the indices value should be compared with the table of the prevalence of the Aedes mosquito.

# 3. The Concept of Health Behavior and Preventive and Control Behaviors

## 1. Health Behavior

**1.1 Meaning;** this word was given its meaning by many people, namely:

Health behavior, in the opinions of J.L Steel. and C. Boom WHO (cited in Sriamporn Mekhmok, 2000) is an activity concerning the sustaining of health or health behavior with the objective of preventing and avoiding the disease.

In aspect of Prapapen Suwan (1991), health behavior is the same as general behaviors that focus on health only, such as good hygiene practice, eating healthy food, and brushing the teeth. To study and complete the meaning of health behavior, the concept of the disease and it occurrences or unhealthy conditions of people will be relevant and often includes preventive behavior and the behavior when they get sick. This is different depending on their beliefs, experience, knowledge, social habits, environment, and other factors.

**1.2 An individual's health behavior** can be divided into the following characteristics:

1) Health promoting behavior is an individual practice to improve the health of an individual or family member.
2) Preventive behavior of the disease is an individual practice that benefits oneself, ones family, and community to prevent themselves from sickness from either communicable or non-communicable diseases.

3) Illness behavior is an action or practice of an individual when they become sick.
4) Treatment and nursing care behavior is an action or practice of an individual to follow medical instructions or the specifications of treatment and care when people get sick.
5) Participating behavior is an action or practice to prevent or improve public health, the community and their collective problems.
6) Self-care behavior is an action or practice to help persons or families in the aspect of prevention and health promotion potential of self-care.

**1.3 Component of behavior consists of 3 aspects:**

1) Cognitive aspect; this relies on knowledge and understanding the meaning of other things including abilities and intelligence skills.
2) Affective aspect; these are the feelings, attitudes, ideas, likes or dislikes, that give value to things that occur in people's minds.
3) Psychomotor aspect; this is the behavior of physical expression by intention or intent to do something in the future.

**2. Preventive and Control Behaviors**

Preventive and control behaviors against dengue hemorrhagic fever (DHF) in the aspect of the researcher, means actions or practices of the student that are beneficial against the transmission of the dengue virus into the body, to decrease or control the disease in that local, and can be acted on or practiced by the student either individually

or in cooperation with other students. This study incorporates the guidelines and measurements of the Department of Communicable Disease Control, Chulaporn District including guidelines from handouts of the management for learning and teaching in the schools to prevent and control DHF. These guidelines are as follows:

2.1 Eliminating or diminishing the Aedes mosquito by sealing the stored water containers with mosquito nets, rubber, or plastic before covering with a lid, turn over unused objects to eradicate breeding sites, or by burning, burying, or destroying the object.

2.2. Prevention and control or elimination of the Aedes larva physically, such as letting fish the Libestes and Gambusia fish eat the larva. The chemical technique is to use Abate sand in objects that not easily covered. Those that cannot be controlled by physical or biological methods include: using other chemical or substance methods, such as vinegar, washing powder, salt in the saucer in food cupboards, or using motor oil, wood ash or resin instead of water.

2.3. Individual prevention (lessening man-mosquito contact) by sleeping under a mosquito net to avoid betting. The elimination of the adult mosquito by using chemicals was not included in this study since it cannot be done by the student. Prevention and control of DHF should include the integration of appropriate strategies in various aspects. The selection of each strategy depends on the situations and conditions in each community and the troubles and threats, as well as the readiness to implement the resources and the acceptance of the methods used, as mentioned above. The resources used in this study

are objects or other equipment that is used for prevention and control of DHF, include the cover or lid of stored water containers, mosquito traps, mosquito nets, Abate sand, bacteria, Libestes fish, plants that can repel the mosquito - citronella grass. Another method is various chemicals used for the destruction of the larva and the adult mosquito. However, this research aims to study only the relevant resources that the student can practice including mosquito nets, screen net, Abate sand, and the covering of containers or other water storage objects.

## 4. Precede – Proceed Framework

Several factors are related to health behavior. The study of prevention and control behaviors against Dengue Hemorrhagic Fever in primary school children in Chulaporn District, Nakhon Si Thammarat Province is based on the concept proposed by Green and Kruter (1991). This concept states that health behavior of individuals is influenced by several factors and the reasons underlying such behavior should be analyzed before making an attempt to change the behavior. The combination of various processes and techniques are required to develop a plan and to determine strategies for health behavior changes.

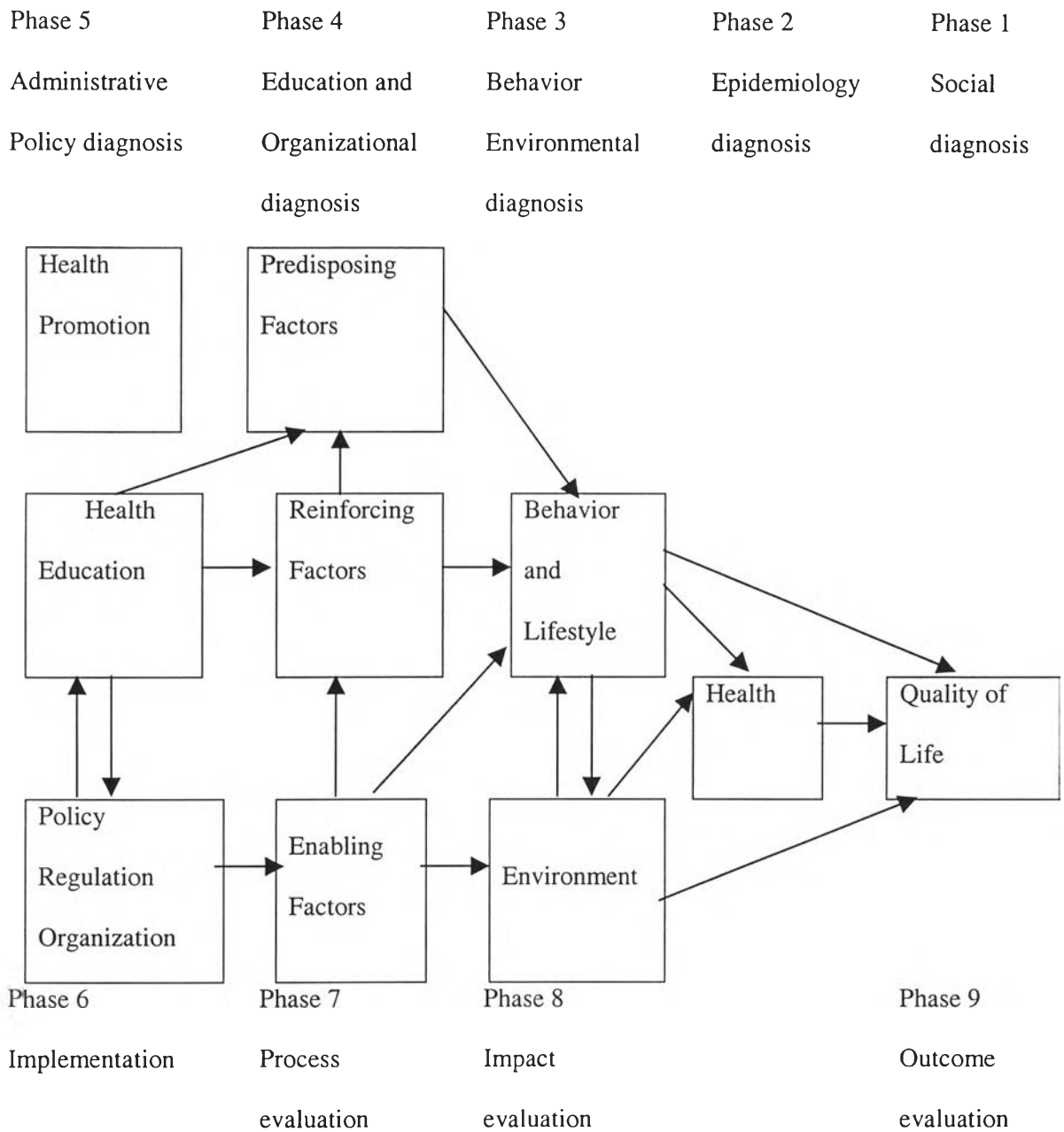
**PRECEDE-PROCEED** framework consists of 2 parts as shown below.

**Part I PRECEDE** (Predisposing, Reinforcing and Enabling Cause in Educational Diagnosis and Evaluation) means the utilization of predisposing, enabling and reinforcing factors for the diagnosis and evaluation of health education performances in order to change health behavior. This process is composed of five

steps of analysis starting with the current situation of the health problems. The problems are then examined backwards to identify the causes of the problems and the obtained data are utilized in the planning of further management for behavioral changes.

**Part II PROCEED** (Policy, Regulatory, Organizational, Constructs in Education and Environmental Development) is the development and implementation of the plan. The PROCEED part must be completed before the planning starts. Then leads to implementation and evaluation in steps 6 to 9. Details about each step of the PRECEDE PROCEED framework are presented below.

**PRECEDE**




**PROCEED**

**Figure 2: Diagram of the PRECEDE-PROCEED model**
**(Green & Kruter 1991:150)**

**Step 1 Social Diagnosis** in a process of considering and analyzing quality of life. It involves the assessment of problems in various population groups, judging which problems have impacts on an individual or group of people and their health. The assessed problems indicate levels of quality of life of the population, for example, unemployment, crime, and overpopulation.

**Step 2 Epidemiology Diagnosis** is an analysis of health problems, which affect the population being studied. The Epidemiology diagnosis helps in specifying health problems, understanding the distribution of the problems and the risk factors related to the problems. The data are then utilized in determining the priority of the problems so that the more important ones can be selected for further management.

**Step 3 Behavior and Environmental Diagnosis** is the process of examining the environmental and behavioral components that are related to health conditions and health problems.

**Step 4 Education and Organization Diagnosis** is an examination of factors that cause or affect health behavior. The factors are categorized into predisposing, enabling and reinforcing factors.

**Step 5 Administrative and Policy Diagnosis** is associated with the assessment of capacity and resources of an organization, as well as its policy, which leads to the management plan, and the actions, which should be consistent with the factors influencing health behavior found from step 4.

**Step 6 Implementation** is the utilization of the plan.

**Step 7-8-9 Evaluation involves** three aspects as follows:

Process Evaluation is the evaluation of problems arising during the implementation as well as the evaluation of the progression of the program in order to assess and ensure that the program is progressing as planned.

Impact Evaluation is the evaluation of unexpected impacts, both in positive and negative ways.

Outcome Evaluation is the evaluation of the outcomes directly resulted from the program. This evaluation includes three issues: effectiveness adequacy and efficiency (Green & Kruter, 1991: 22-31).

This research only focused on Step 4 of the PRECEDE PROCEED framework. It was an examination of factors related to preventive behaviors of Dengue Hemorrhagic Fever. These factors are categorized into predisposing, enabling and reinforcing factor.

**Social Support Theory** (Birch, 1998: 159 - 161; Isael & Schurman, 1990: 187 - 215)

Social support has been identified as a motivating factor for positive health behavior and linked to an improved health status.

Social support involves people or groups of people - organization - who provide assistance to others. Social support that might be helpful includes: information, listening, encouragement, money, equipment and assessment. Social support can help individuals begin or continue healthy behaviors, and it can help them feel better about themselves and their lives.

**Types of Social Support** was divided into 4 types

1. Emotional Support is the supporting of an emotion such as making one content, giving acknowledgement, and concern about worrying.
2. Appraisal Support is the supporting of evaluations such as giving feed back, affirmation of the practiced outcome or telling the person about the best things they did.
3. Information Support included such things as suggestions, motivation, advice, and various kinds of information exchange.
4. Instrumental Support is the supporting of equipment, such as labor, money, and time.

## 5. Related Research Study

Most research on DHF is about surveys or studies concerning knowledge and attitude or practices in various groups of people, the study of the health education programs, the effectiveness of health education program to practicing disease control, the participation of sharing of various organizations in the community, and the comparison among other prevention and disease control programs in the community. Most of the studies concern the relationship among each variable in preventive and

control behaviors that were found in other diseases, or found in the study of health behavior, or self-care. Therefore, the factors that were found minimally in the study or were not find directly in the study area are shown below.

**1. Gender**

Chooanong Asarat (1994) studied the health behavior of the DHF disease among primary school student, in the 9$^{th}$ zone of the education. The data was collected by the use of a questionnaire with 500 students in grade 6 and the returned answers included 450 participants, of which 226 were male and 224 were female. The results revealed that the practices between these groups were not difference.

Sujittra Phookaoluan (1997) studied the preventive behavior of iodine insufficiency disease in primary school student of Krabi Province. The sample population was 394 students in grades 4-6 of which, 99 students were male and 195 students were female. By using a multistage sampling among the students, it reported high insufficiency in iodine in 200 students and a low insufficiency in iodine in 194 students. A questionnaire and in-dept interviews were used to collect the data. The results found that gender is not associated with preventive behavior of iodine insufficiency.

Both genders have association with preventive behavior and no difference was found between the sexes. This variable was not often used in other studies; therefore, this variable will be included in this study.

## 2. Knowledge

Chooanong Asarat (1994) studied health behavior relayed to the DHF disease among primary schools in the 9th zone. The results revealed that most of the student knowledge of the DHF disease was moderate; the same as the practice of prevention and control.

Pornpimol Puang-ngeon (1994) studied the situation of the DHF disease in the Huay Kwang Slum, Bangkok in the community environment, the practice in prevention and control of the DHF disease in the Bangkok staff, including knowledge, attitude, and practice of the people in this community on prevention and control of the DHF disease. The sample population was the head of the family or the representative in 712 cases, by sampling 629 households. The data was collected by interview during the period of September through December 1994. The study revealed that more than half of the study population had low-level knowledge of the DHF disease and found that the relationship between knowledge and practice was significant ($p<0.05$)

Nuanlaoo Vivatvorapan (1994) studied the evaluation of prevention and control of the DHF disease in primary schools, in Muang District, Nakhon Ratchasima Province. The study population was 210 teachers of grades 3-6 from 11 schools. The evaluation was on continuous practice group and its problems in prevention and control of the DHF disease. The other group was 1,000 students in grade 6 from 11 schools, by evaluating their knowledge, attitude, and practice on prevention and control of the DHF disease. A questionnaire was used for data collection. The study revealed that 4 schools had continuous and complete coverage and most of the student has a moderate level of knowledge.

Surachai Sirawon et al. (1996) studied the results and its impact of the control program on the DHF disease in the schools of the 5th zone. The study population was 16 primary schools and incomplete data was collected from 8 of those schools. The results showed the student from the complete practiced school showed a higher average mean level of knowledge than the incomplete practice school and was significant (p=0.005, 0.003, 0.002, and 0.007 in the student grade 3,4,5 and 6, respectively).

Chalus Glinubol (1998), studied DHF preventive behavior and factors which affect such behavior. The study population was 400 grade 6 students in the 1998 academic year under the primary Provincial Education Department of Phetchaburi Province. The research revealed that subjects had medium levels of preventive behaviors; warnings from health education teachers; information received concerning DHF; and knowledge about DHF. All three variables were positively related to the preventive behavior of DHF and were capable of forecasting 20.4 percent of the preventive behavior.

Tran Ngoc Huu (1998), studied factors affecting Dengue Haemorrhaegic Fever prevention behavior of housewives. Data were collected by interviewing 223 housewives. At Benlue disrict, Longgan province. In the South of Vietnam. The study reveals a statistically significant relationship of the following variables with housewives' DHF prevention behaviors: housewives' knowledge on DHF, perception on severity, susceptibility to DHF and and benefit,difficulty of DHF prevention, attitude on community- based DHF prevention methods and social activities. The age group of 35 - 45 years, as well as the occupational group of farmers, show higher level of

prevention behavior than others. No significant difference is found for the various levels of education.

The study of knowledge revealed the relationship between the knowledge of health care, prevention and control of various diseases and the prevention and control of health care behavior. The knowledge level of the DHF disease was in a range of low to moderate. However, the related studies did not present the relationship among the factors of knowledge of the disease, prevention and control of DHF or the preventive and control behaviors of DHF of the student in this study. Therefore, this variable was included in this study.

### 3. Attitude

The study of Nuanlaoo Vivatvorapan (1994) on the evaluation of the prevention and control of DHF project in the primary school, Muang District, Nakhon Ratchasima Province, revealed 87.2% of the students had attitudes in prevention and control at a moderate level. The study of Chooanong Asarat (1994) on health behavior and the DHF disease among primary schools in the $9^{th}$ zone, found that most of the student had a good level on attitude, but a moderate level on practice.

Nalinee Magornsen (1995) studied factors that influence health behavior following national health recommendations among primary school students. A total of 517 students in grade 6 were the study population, 252 males and 265 females. The cluster random sampling technique was used with 30 clusters from the WHO. The study found the attitude on health had a positive relationship to health behavior by national health recommendations and was significant ($r = 0.241$, $p<0.001$)

The study of Bunyat Junsa, et al (1996) covered knowledge, attitude, and health behavior among health volunteer in Lei Province. The study population was health volunteers who attended the training programs for elementary health and consumer rites knowledge, and health volunteers who continuously attend these training programs. This consisted of 410 people (127 males and 283 females), in 12 districts. A systemic sampling collected data. The study found no relationship between attitude and behavior.

Kanica Suwanna (1998) studied factors related to self-care behavior of grade 5 students from the schools under the Department of the Primary Schools, Muang District, Nakhon Si Thammarat Province. It had a study population of 361 students, of which 167 were male and 194 were female. The multistage sampling technique and a questionnaire were used for data collection. The results found attitude had a positive relationship on the behavior of the student in significant $(r = 0.474, p<0.01)$.

According to the reviewed literature, most of the studies were concerned with attitudes and preventive behaviors towards other diseases, not DHF. The study population was both school age children and others. The studies revealed positive attitudes and had no relationship to the health behavior for the prevention of the disease. The researcher on its positive relationship to preventive then questioned attitude and control behaviors towards DHF, since attitude is a thinking process causes by emotions that can lead to an increase an action, it was selected to be the variable.

**4. Income of the parents**

Sawangjai Chaiyasit (1996) studied environmental health behaviors and

knowledge of the epidemic of the DHF disease among 325 housewives in the rural area of Tumbol Naking, Tadpanom District, Nakhonpanom Province. The average income of this group was mostly less than 1,000 Baht per month. The results revealed that the difference of income had no relationship with preventive behavior ($p > 0.05$).

Kanica Suwanna (1998) studied factors related to self-care behavior among students, and found that the income of their parents was a significant and positive relationship with the two variables ($r = 0.442$, $p < 0.01$).

According to those studies, the income of the parents is positive and had no relationship with health behavior. Pender, 1982 (cited in Kunchalee Poomarin, 1992) stated that social status and good income would help the person gain more opportunities in seeking appropriate services, including providing themselves with various equipment and promotion of self-care. The researcher was interested and included this factor in this study.

**5. Sufficiency of resource for the Prevention and Control of DHF**

Apichart Mekmasin (1994:110) studied the probability of a DHF control project in the school in 1993. The objective of this study was to find probable activities of this project, its problems, health's aids, and chemical support. The research was conducted in 225 schools by interviewing administrative personnel and teachers who were responsible for the school's health activities. The largest problem found was the sluggish support of the health aids and a meager amount of relevant equipment.

Sujitra Pookaoluan (1997) studied the preventive behavior of iodine insufficiency of primary school students in Krabi Province. The result found that the families and schools providing support was significant and had a positive relationship with preventive behavior ($p< 0.05$). The ability of seeking the source of drinking water in which iodine had been added in the school had no relationship with behavior ($p> 0.05$).

From the review of the literature, each health factor has either a relationship or not with preventive and control behaviors, but if there was a lack of or an insufficient amount of this factor, the prevention and control of diseases will not be successful. (Lawrence W. Green,1991 cited in Makemog, S) The limitation of resources of the population may limit them from the health administration and thus, will affect that persons approach to the resources. Therefore, the researcher needs to study this factor.

**6. Social Support from teachers, parents namely suggestions, encouragement and praise in practice to control the DHF.**

Kanica Suwanna (1998) studied factors related to self care behavior among the students at Nakhon Si Thammarat Province, and found that the admonishment from the parent on self care had a positive relationship to their behaviors, significance ($r= 0.576$, $p <0.01$)

Saeunk, P. (1992: 82-89) studied the effectiveness of a Health Education program with a modification of the Health Belief Model and social support through teachers and fathers or mothers for preventive behavior of DHF among grade 6 students

in Muang District, Nonthaburi Province. The results showed that after the experiment, the sample in an experimental group statistically gained more perception regarding susceptibility, severity and benefit as well as in preventing DHF than prior to participation in this program and statistically achieved a lower proportion of containers with larva of *Aedes aegypt* Breteau Index (B.I.) in the experimental group decreased from 1,418 to 816. There was a relationship between social support from teachers and fathers or mothers and practices in preventing DHF.

Yongyut Wangroongsup (1994) evaluated the primary school practices to control DHF in the schools by interviewing the study population of health hygiene teachers from 90 schools that joined the project throughout the country. The study found that the frequency of instructions and support for the student to join this project in larva and Aedes mosquito's control are as follows: somewhat instructive but not regular (38.9%), once per month (22.2%), 2-3 times per month (21.1%), and once per year (6.7%)

Konputhorn, S. (1998: 86-91) studied the application of the health belief model and social support on the improvement of preventive dental care behavior in grade 6 students in Piboonmangsaharn District, Ubonrachatani Province. The results of the study showed that the experimental group had higher knowledge, perceived susceptibility, intense interest in dental care, perceived benefit in complying with teachers, parents and their peer group's advice, as well as preventive dental care behavior after the intervention period, and also being better than that of the comparison groups. Their average plaque index had also significantly decreased.

Wahyu Sulistiangsih, (2001) studied oral health behavior among primary school children in Nakhon Phatom Province. The sample included 200 primary school children ($6^{th}$ grade). The results showed that the most important factor were parents' support, reminders for tooth brushing (93.5%), giving information about healthy food for healthy teeth (82.5%), teachers' support in giving instructions for practicing (95.5%) and information about tooth brushing techniques (97 %).

From literature review, it was concluded that social reinforcement, instructions, stimulation, and praise from teachers and parents affect the preventive and control behaviors of the students and most of the relationships showed positive results. But it is because of the study of this factors was not found in DHF disease, therefore the researcher want to study.

**7. Accessing to information about DHF**

Wanna Yanroj (1991) studied factors influencing the DHF disease in Chiang Mai and compared the incidence rate of DHF at the highest level in 220 households and lowest in 320 households using multistage sampling, interviews and observation of the environment and a survey of the plentiful larva in each household. The results found factors of incorrect behavior in the population, a lack of knowledge in DHF disease, not receiving information of the onset of the disease and never knowing about Abate sand, obstructed the diseases prevention.

Patom Nuankum (1992) studied factors regarding social and cultural influence of the consumer on health behavior on iodine in the population of Maehongson

Province. The results showed 51.7% of this group did not get good enough information on iodine insufficiency disease from mass media. The information on disease prevention from relatives and friends did not influence the iodine consumer's behavior.

Kanokwan Wethasil (1995) studied the relationship between selective factors and the intension to practice the prevention of AIDS in 348 students of grade 6, Sakonakorn Province, by multistage sampling technique. A questionnaire was used as a tool in this study. The results found that the receipt of information on AIDS had a positive relationship to the intension to practice disease prevention, significance *($r = 0.237$, $p = 0.001$)*

The review of literature and research studies reveals the receipt of information has and doesn't have a relationship with preventive behaviors. In aspect of the researcher, those factors probably have relations in a positive way.

**8. Preventive and control behaviors against DHF.**

Jiraporn Valaisateon, et al. (1992) studied the knowledge, attitude, and practice of the DHF disease in the slums of Nakornratchasima Province. The study population was housewives or heads of the families or adult members, with one sampling from 50% of the households in one outstanding community (51 households) regarding basic needs, and the other one from the community, which has moderate basic needs (59 households). The data were collected by interview; the majority group of this sample was housewives. The results confirmed that, knowledge, attitude and practices of the DHF disease of both communities were similar in their collective attitudes of DHF disease prevention, while 50% of this had been corrected in practice.

Nuanlaoo Vivatvorapan (1994) studied the evaluation of prevention and control of DHF in primary schools, Muang District, Nakhon Ratchasima Province. This study revealed that the students of the school which continuous and complete activities had a level of practice in every aspects ranging from good to better compared with the school which were not completely and continuously practiced *($p<0.05$)*.

Chooanong Asarat's (1994) studies on health behavior and the DHF disease among primary school students in the 9$^{th}$ zone, found that 94.9% of the students had a moderate level in overall practices, while a good level had only 4.7%. When the questionnaire was considered for each item, the least practiced activity was the use of mosquito prevention cream on the legs and arms and covers needed to cover flower vases.

Surachai Sirawon, et al. (1996) studied the results and its impact on the control program of the DHF disease in schools of the 5$^{th}$ zone. The results stated that students from the completely practice schools showed a difference in frequency of the practice of controlling the disease and eliminating the breeding sites in the difference of average mean of knowledge on DHF disease than the incomplete practice school.

Sriamporn Makemog, (1999) studied factors associated with preventive and control behaviors toward DHF among school-aged children in Buriram Province. The sample consisted of 350 - 5th grade students in schools of the Department of Primary Schools, Pluplachai District, Burirum Province. The results showed that 67.2 percent of the eligible children had a moderate level of preventive and control behaviors toward

DHF. The most common proper practices were avoiding mosquito bites and closing water containers after use. The least common practice was eliminating breeding sites (vase, dish). Most subjects performed these actions with a frequency of "sometimes." Statistically correlated with prevention and control behavior ($p< 0.05$) were advice from parents, teachers and health personnel and information from the media. The sufficiency of resources was significantly related to prevention and control behaviors ($p< 0.05$).

Poonsuk Bunsuan, studied factors related to preventive behaviors of mothers on acute DHF in Petchabun Province. The sample was comprised of 420 mothers with children aged 1 day to 14 years who took their children to received care at the Health Center in Petchabun Province. The results of the study showed that the mothers overall preventive behaviors of acute DHF was good level. Most subjects regularly conducted preventive behaviors but a minority of the sample didn't conducted activities for the prevention of acute DHF. Age, family income, resources for prevention and social support could predict prevent behaviors on acute DHF by 59.60 percent at a statistically significant level.

From research reviewed in the preventive and control of DHF in the most sample of the student, found that the practice level is quite low and also incomplete answers. The most study is focus on health education program or studies the cooperation of the community in prevention of the disease or survey of the attitude, knowledge and practices on preventive and control of DHF. According to the student is the most high-risk group in this disease, therefore the researcher aims to study these

factors including with the relation of each factors to preventive behaviors of the student. The result of this study might have a positive impact to planning of the prevention and control of DHF disease.

### 9. Studies concerning the PRECEDE Model

Narinee Magornsen, (1995) studied the factors that influence health behavior by the national health recommendations of students in grade 6, Supunburi Province and used the PRECEDE Model as a conceptual framework. He found that the independent factors such as knowledge, attitude, and value, and dependent factors such as education of parents, environmental hygiene provided in the schools or had a relationship with national health behaviors *($p<0.000,0.05$, and $0.005$, correspondingly)*. However, gender and stimulation by teachers regarding health had no relation to health behaviors following national health behavior guidelines *($p> 0.05$)*. A dependent factor, such as value and an independent factor, such as health environment arrangements in the schools and a reinforcing factor, such as the attention the parents pay on the student's health shared the explanation of the transformation of health behaviors *($p>0.01$)*. The influence of these three variables can predict 35.5% of the practice of good health behaviors.

Kanica Suwanna (1998) studied factors related to self-care behavior among the student by using the PRECEDE model, which included gender, knowledge, attitude, and self-confidence as independent factors. The dependent factors included income of parents and the standard of services of health promotion. The reinforcing factors were the instructions from parents and teachers. The study revealed that all factors were positive and significant with the self-care behavior of the student *($p< 0.01$)*.

A review of the studies found that independent, dependent, and reinforcing factors both had and didn't have a relation with health behavior. The advantage of the PRECEDE Model is its appropriateness used to analyze the cause of the behavior as well as analyzing both internal and external factors of the individual. It appropriately integrated various sciences. Therefore, the researcher wanted to use the PRECEDE Model in this conceptual framework of the prevention and control of the DHF disease of the student in this study.