

**EFFECTS OF A TEACHING PROGRAM ON KNOWLEDGE AND
SELF-CARE BEHAVIOR REGARDING DECREASING IRON
ACCUMULATION IN THE BODY OF CHILDREN WITH
THALASSEMIA AT NAN HOSPITAL, THAILAND**




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EFFECTS OF A TEACHING PROGRAM ON KNOWLEDGE AND SELF-CARE BEHAVIOR REGARDING DECREASING IRON ACCUMULATION IN THE BODY OF CHILDREN WITH THALASSEMIA AT NAN HOSPITAL, THAILAND.

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ABSTRACT

This research was a quasi-experimental study aiming to examine the effects of a teaching program on knowledge and self-care behavior related to decreasing iron accumulation in the body of children with thalassemia. The sample consisted of 52 children with thalassemia aged 7-19 years who receive medical care at Nan Hospital. The sample was divided into two groups of 26, namely the experimental group and control group. The sample in the experimental group received a teaching program. The sample in the control group received usual medical care. Data were collected using a questionnaire asking about knowledge and self-care behavior. The knowledge and self-care behavior of each group was assessed prior to the intervention and at a four week follow-up after the intervention. Statistical analysis used ANCOVA.

The results of this study indicate that children with thalassemia who received the teaching program had better knowledge and self-care behavior than children who received routine medical care at a significant level ($p < 0.05$).

According to the results of this study, there should be teaching program via VCD used as a nursing intervention and a cartoon book provided to thalassemic children to review at home. After the teaching program, nurses should give positive reinforcement to children such as giving praise or encouragement. Phone call follow-ups addressing self-care behavior and giving positive reinforcement to children within two weeks should also be done.

KEY WORDS: TEACHING PROGRAM / IRON ACCUMULATION /
THALASSEMIA/ CHILDREN / SELF-CARE BEHAVIOR

95 pages

ผลของโปรแกรมการสอนต่อความรู้และพฤติกรรมการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกายของเด็กโรคธาลัสซีเมียที่โรงพยาบาลน่าน ประเทศไทย

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บทคัดย่อ

การวิจัยครั้งนี้เป็นการวิจัยกึ่งทดลอง เพื่อศึกษาผลของโปรแกรมการสอนต่อความรู้และพฤติกรรมการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกายของเด็กโรคธาลัสซีเมีย กลุ่มตัวอย่างที่ใช้ในการศึกษาค้นครั้งนี้เป็นเด็กวัย 7-19 ปี ที่ป่วยเป็นโรคธาลัสซีเมีย ที่รับการรักษาที่โรงพยาบาลน่าน จำนวน 52 คน แบ่งเป็น กลุ่มทดลอง 26 คน และกลุ่มควบคุม 26 คน กลุ่มทดลองได้รับโปรแกรมการสอน ส่วนกลุ่มควบคุมได้รับการพยาบาลตามปกติ เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามวัดความรู้และพฤติกรรมก่อนการสอนและหลังการสอน 4 สัปดาห์ วิเคราะห์ข้อมูลโดยใช้สถิติ ANCOVA

ผลการวิจัยพบว่าเด็กโรคธาลัสซีเมียที่ได้รับโปรแกรมการสอน มีความรู้และพฤติกรรมการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกายของเด็กโรคธาลัสซีเมียดีกว่ากลุ่มที่ได้รับการพยาบาลตามปกติ อย่างมีนัยสำคัญทางสถิติ ($p < 0.05$)

จากผลการวิจัยครั้งนี้ ผู้วิจัยมีข้อเสนอแนะว่า ควรนำโปรแกรมการสอนไปใช้ในปฏิบัติการพยาบาล การสอนเด็กโรคธาลัสซีเมียควรจัดให้มีการสอนด้วยวิธีดีและแจกหนังสือให้เด็กกลับไปอ่านทบทวนที่บ้าน หลังการสอนผู้สอนควรมีการเสริมแรงทางบวกแก่เด็กโรคธาลัสซีเมียด้วยการพูดชมเชย พูดให้กำลังใจ ควรมีการโทรศัพท์ติดตามผลการปฏิบัติตัวร่วมกับการให้เสริมแรงทางบวกแก่เด็กภายใน 2 สัปดาห์

95 หน้า.

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CHAPER I

INTRODUCTION

Background and significance of the study

Thalassemia is an inherited genetic disease that cause from single gene disorder. This disease is occurs more than other blood disorder disease (Wanachinawin, 2006). In Thailand about 30-40% of the population or 18-24 million people are predicted to be carriers, having the abnormal genes. About 1% of population or 600,000 people have thalassemia. In addition, newborn babies are diagnosis as thalassemic patient about 12,000 people in each year (Parnsatientkun, 2003). This disease is become a serious problem and patient is require medical care for whole life. The cost for medical care is approximately 180,000-250,000 baht for patient per person per year (Parnsatientkun, 2003). Thalassemia children were treated at Nan hospital approximately 794, 824, 856 times in year 2004-2006 respectively (Medical record department, 2006). According to statistics, number of children with thalassemia needs medical care increasing in every year. Therefore, this disease becomes serious problem.

This inherited genetic disease cause red blood cells by being destroyed in the bone marrow or red blood cell damaged in the process of hemolysis, subsequence is chronic anemia and complication of anemia (Fuchareon & Wasi, 2001). Nowadays, stem cell transplantation is only curative therapy. There are about 75%-92% chance to completely cure from this disease. However, the patient should have severe thalassemia and must have relative that could donor identical of a histocompatibility (HLA) (Tonpijit et al., 2005).

The treatment for thalassemic patient is mostly packed red cell transfusion including low transfusion and high transfusion. This method will protect patients from anemia. Consequently, it will improve life quality of the patient. However, if patients are treat by red cell transfusion more frequencies, it might cause of complication especially iron overload (Hilliard & Berkow, 1996). Due to, every 1 ml of red blood

cell has iron up to 116-232 mg of iron (Cao et al., 1997). Moreover, thalassemic patient produce low quality of red blood cell, so the body will try to build more red blood cell by absorb iron from gut more than usual (Wanachiwanawin, 2001). In addition, only few amount of iron will excess by stool, sweat from hair and skin due to patient body do not have mechanism in chelation of iron (Lelahakun & Puddaechakum, 2002; Andrew, 2005). Therefore, highly accumulation of iron will found in several organs such as bone marrow, heart, liver, spleen, pancreas and endocrine gland etc. High level of iron will effect on patient growth, skin, weakness which might able to cause of several severe disease such as Diabetes Mellitus, Cardiac arrest (Laosombat, 1998). Most likely, iron overload is found in patient that has severe thalassemia and might cause the patient to death at early age (Phutrakul, 2001).

Standard medical care for thalassemia is treat patient with blood transfusion and iron chelation regularly (Weatherall, 2005). Iron chelation by injection method is known as the most effective treatment for thalassemic patient. However, this medical care is expensive in both medical and instrument (Tonpijit, 2005). Therefore, Nan hospital has policy in treat children with thalassemia with iron chelation and then encourage parent to take their own self-care at household. Nowadays, approximately 124 children were diagnosis as thalassemic patient. But, only 34 are able to afford medical care from hospital. The rest of patients (about 100 children) are not able to receive iron chelation due to their poor economy. These children have highly chance to have iron overload and may cause to them to death.

There are two main reasons that cause iron overload in thalassemic patient. Patient with severe anemia receive blood transfusion frequently. More blood receives from transfusion will increase more iron in patient. Also, thalassemic patient produce low quality of blood cell. Therefore, patient body will absorb more iron from food to substitute from damage red blood cell (Phutrakul, 2001). Thalassemic patient has high level in iron absorption from food about 3-4 times more than healthy people (Cao et al., 1997). Especially, children with thalassemia often found lack of knowledge in chosen appropriate food for the disease. Arayapittaya (1990) reported that patient choose their diet base on their understanding. Patients choose foods that have animal blood because they believe it will increase quality of their blood. Similarity, Natiles (1998) and Boranmul (2001) thalassemic patient is always add animal liver and blood in their diet

and discard green vegetable in the same time. Despite the wrong information, it will cause them high possibility to have iron overload.

Researcher interesting in develop new media program to increase knowledge about how to reduce risk in iron overload in children with thalassemia who receive blood transfusion frequency and do not receive iron chelation. This program will focus on provide information about iron overload and how to decrease level of iron accumulation. If children with thalassemia have enough knowledge on iron overload and self-care behavior, it will help decrease level of iron accumulate resulting in decrease number of blood transfusion. This hypothesis is supported by similar result from research of Munkunann (1998). Moreover, several food nutrition such as tannin from tea, soybean milk, egg and flour etc., are able to reduce amount of iron absorption from intestine. It will effect on decrease iron accumulation. Similar Kaltwasser et al. (1998) reported patient who drink tea more frequently have low accumulation level of iron. However, thalassemic patient need to avoid food with high level of iron such as animal product and some vegetable with high level of iron as well (Telfer, 2003).

Even though, information about appropriate food for children with thalassmia distributes in public but they are not concern about local food (Natiles, 1998; Pongsing, 1997; Munkunann, 1997; Boranmul, 2001). In North part of Thailand, some local foods have high iron for example Nam Ngiew. This meal has about 509.6 mg of iron because it has animal blood in recipe (Subchareon, Dewiset & Termwiset, 2001). Therefore, this research program will provide information about how to choose appropriate local food, consequence to decrease iron accumulation for children with thalassemia at Nan hospital.

Children in difference age have different level in development of cognitive. Therefore, the research program should consider in this differentiation to receive effective result. Base on Piaget's theory, school age children have concrete operation which means they have ability to understand simple logic base on what they see. This group of children is able to take care of their health if they receive information in self-care behavior. For teenage children have formal operation which means they have ability to think abstractly, reason logically and draw conclusions from the information available. Therefore, they are able to analyze problem in order along with reasons

(Whaley & Wong, 1999). Type of media effect on children attention, the television is found to have influence in school age and teenage children (Villani, 2001). So, video tape should be appropriate type of media to use in this research program. However, video tape has limitation in short self life (Malithong, 1995). Moreover, nowadays this type of media is considers as low technology when compare with computer or video compact disc (VCD).

Cartoon was made children more understanding (Thammasaroj, 1999). Review study about effect of teaching program for children with thalassemia such as Pinthong (1992) used flip chart as a teaching program. It was contained of flip chart represented by cartoon picture and giving lecture from researcher but lack of sound and picture movement to stimulate children to have a good attention. Natiles (1998) teaching by used a video tape represented with children as a performer. So teaching program would lack of cartoon story for entertains children. Therefore, the researcher interesting in using VCD as teaching program to provide information to children with thalassemia. The teaching program has content, cartoon animation and sound which should be able to get attention from children and has more understanding. Moreover, VCD has long self life and convenient to carry with will suitable with health care team (Malithong, 2005). The health care team will be able to give the lesson to children with thalassemia in and outside hospital, safe time to prepare lesson and able to provide same information even with different group of children. Moreover, children will be repeating the lesson by themselves at their own household. Even though, children will have long memory on lesson if use computer assist instruction (CAI), because of interaction between computer and children. However, this CAI method has limitation on number of computer at hospital. Most likely, hospital has few computer and all of them for operate in medical procedure. Therefore, VCD is type of media that more convenient and able to use widely in public.

Due to limitation in one way interaction of VCD program, after presentation is finish, children will allow to ask question. Also, health care team will give summary and giving praise to children who able to answer the question. Moreover, children will receive a cartoon book to review at home. Cartoon book is type of media that appropriate for children in every age, especially children in school age. Cartoon book is able to entertain children and able to provide information such as self-care behavior

in the same time (Janejirawattana, 1995). This teaching program is corresponding with Operant Conditioning's theory of Skinner (1953). This theory is about relationship between stimulus, response and then reinforcement. The reinforcement will result in good behavior. The VCD program and cartoon will stimulate children with thalassemia to learn about self-care behavior. From positive reinforcement children with thalassemia will change their behavior in self-care especially in chosen appropriate food. Consequently, the iron accumulation will decrease. Children do not have to receive blood transfusion due to severe anemia. Reduce absorption of iron from intestine and chosen healthy food. All of this will improve life quality of children with thalassemia.

Research Question

1. Did this teaching program help the children with thalassemia increase their knowledge regarding decreasing iron accumulation in the body?
2. Did this teaching program help the children with thalassemia improve their self-care behavior regarding decreasing iron accumulation in the body?

Purpose of the study

1. To compare the scores of knowledge regarding decreasing iron accumulation in the body between the group of children with thalassemia receiving teaching program and that receiving routine medical care.
2. To compare the scores of self-care behaviors regarding decreasing iron accumulation in the body between the group of children with thalassemia who receiving teaching program and that receiving routine medical care.

Hypotheses

1. At four-week after the intervention, the group of children with thalassemia receiving teaching program had higher scores of knowledge regarding decreasing iron accumulation in the body than that receiving routine medical care.
2. At four-week after the intervention, the groups of children with thalassemia receiving teaching program had higher scores of self-care behavior regarding decreasing iron accumulation in the body than that receiving routine medical care.

Conceptual Framework

This teaching program based on operant conditioning theory by Skinner (1953). This theory is considering in the group of Stimulus-Response's theory. The operant conditioning's theory, behavior is relating to environment, so emitted of human is depending from consequence of environment at that moment (Aeamsupasit, 2007). On the other hand, human behavior has its consequences. Human will learn from consequence and behavior in the future will base on its consequence.

Reinforcement and Punisher are considering as two type of consequence. Reinforcement is behavior that happens from stimulation and have tendency to happen again in the future, so this behavior will happen more frequency or permanently (Skinner, 1971). Reinforcement is may be positive or negative reinforcement. Positive reinforcement is stimulus that will increase level of response such as praise, prize and food, etc. Negative reinforcement is stimulus that will decrease level of response such say out loud, hot weather and blame, etc.

The stimulus for behavior also dividing into two groups as well including Continuous reinforcement and Intermittent reinforcement. They are four groups of Intermittent or Partial reinforcement, following;

1. Fixed ratio is a response in reinforced when a given number of response has been emitted.
2. Variable interval is response has been reinforced in the average every five minutes but unpredictably.
3. Variable ratio is reinforcement occurs after an average number of responses but unpredictably.
4. Fix interval is response has been reinforced for sometime only once every certain minutes.

Punisher is reinforcement from certain behavior and result in suppress the behavior (Aeamsupha, 2007).

Therefore, this research is applying operant conditioning theory to use as conceptual framework. The researcher is using stimulus, its response and reinforcement to use as tool in Nursing Intervention. The VCD and cartoon book in title of "Decreasing iron accumulation in children with Jane and Big" will use as stimulus in children with thalassemia. The information from VCD, cartoon book and

communication after presentation will encourage children with thalassemia to change their behavior. Consequently, iron accumulation may decrease in children with thalassemia. Then the positive reinforcement such as praise in their self-care behavior will give to children with thalassemia again, as diagram describe below;

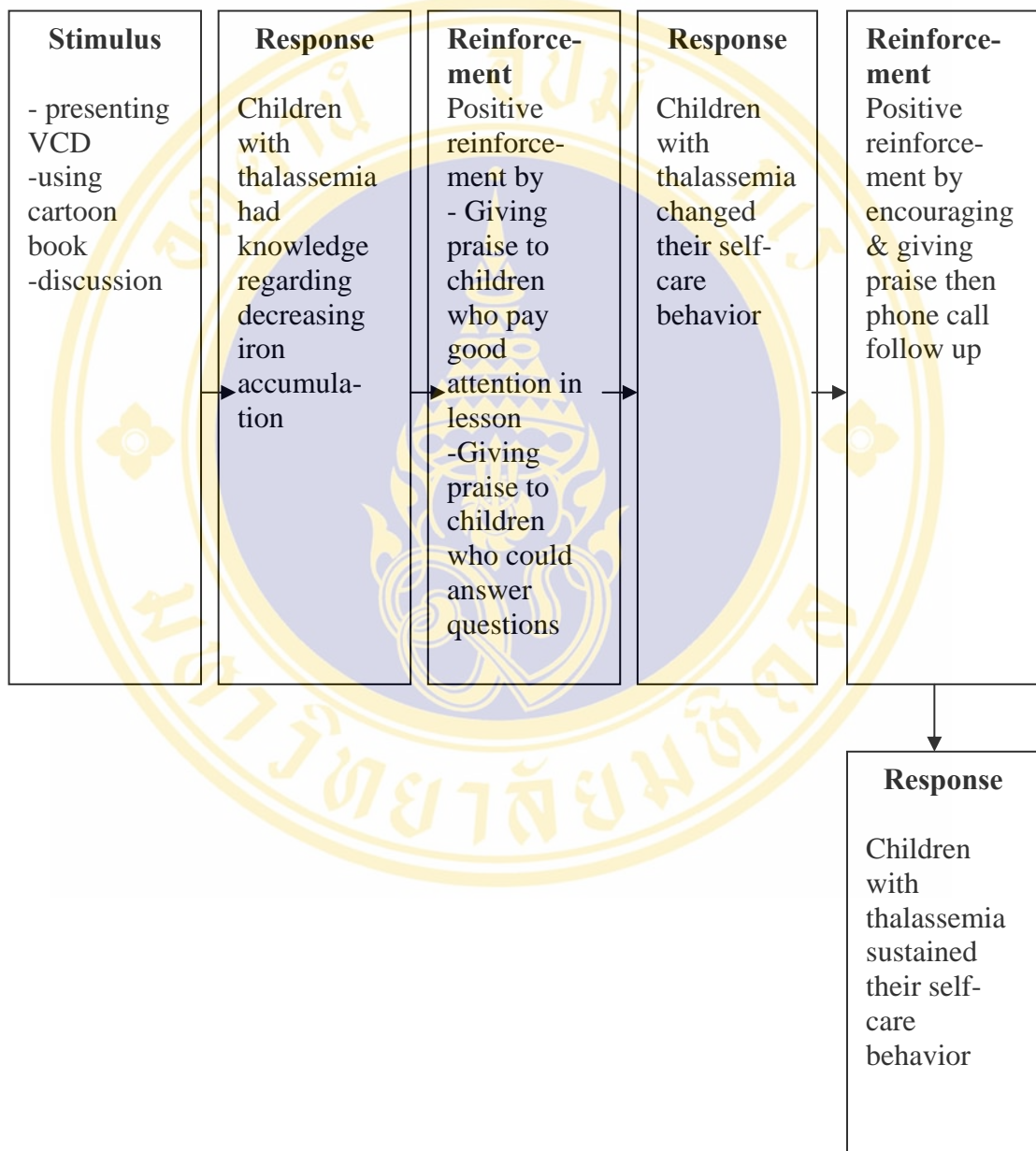


Figure 1. Conceptual framework

Scope of the study

This research is a quasi-experimental study which examined the effects of a teaching program on knowledge and self-care behavior regarding decreasing iron accumulation in the body of children with thalassemia aged between 7-19 years at out-patient hematology clinic, and in-patient pediatric unit at Nan Hospital, Thailand.

Expect outcomes and benefits

1. Get a teaching program media regarding decreasing iron accumulation in the body of children with thalassemia. Inform VCD and cartoon book for school-age children and adolescent children with thalassemia. The program will improve their self-care behavior and resulting in decreasing in iron accumulation.
2. This teaching program can be used as guidelines for other health care professionals to teach parents and pre-school children with thalassemia for decreasing iron accumulation in the body of children with thalassemia in both in and out hospital.

Definition of terms

Teaching program

Teaching program was defined as providing knowledge and guidance of self-care behavior for children with thalassemia. The teaching was performed in a form of small group teaching of 3-5 children with thalassemia. According to the teaching plan, the content consisted of signs and symptoms, iron overload, treatment and guidance of self-care behavior for decreasing iron accumulation in the body of children with thalassemia. Teaching media were composed of 22-minute VCD entitled “Decreasing iron accumulation with Jane and Big” and a cartoon book entitled “Decreasing iron accumulation with Jane and Big” for reviewing at home. Both media had similar content.

Knowledge regarding decreasing iron accumulation in the body

Knowledge regarding decreasing iron accumulation in the body was defined as the knowledge about characteristics of thalassemia signs and symptoms of iron

overload, cause of iron overload and guidance of self-care behavior for decreasing iron accumulation in the body. It was measured by using structured interview questionnaire of knowledge regarding decreasing iron accumulation in the body developed by the researcher. The questionnaire contained 20 items with three answer choices: 'yes', 'no' and 'do not know' for each item.

Self-care behavior regarding decreasing iron accumulation in the body

Self-care behavior regarding decreasing iron accumulation in the body was defined as activities performed by children with thalassemia aiming at decreasing iron accumulation in the body. Such activities are choosing appropriate food, rest, exercise, protecting themselves from accident, and infection, hygiene care, observing abnormal sign and side effect of treatment, observing abnormal signs during and after blood transfusion and general health care for thalassemia. The behavior was measured by using structured interview questionnaire of self-care behavior regarding decreasing iron accumulation in the body, developed by the researcher. The questionnaire contained 30 items with four-rating scale: never, sometimes, frequency, everyday or every time.

Routine medical care

Routine medical care was defined as medical care provide in out-patient hematology clinic, and in-patient pediatric unit at Nan Hospital. Routine medical care consisted of body weigh and vital signs checking as well as blood aspiration for hematocrit. Afterwards, diagnosis, prescriptions, and advice were given to children by the pediatrician. Then the nurse advised children and parents about medication, future investigation and follow-up appointment. In case of children with thalassemia who received blood transfusion, they must receive blood transfusion at in-patient pediatric unit due to inconvenience of doing the transfusion at out-patient hematology clinic. The nurses at in-patient unit provided blood transfusion and general health care suggestion for children and parents. Routinely, the suggestion and guidance of proper self-care were provided to the patients at the first visit only. No special intervention had been provided afterwards.

CHAPTER II

LITERATURE REVIEW

This research is a study of the effects of a teaching program on knowledge and self-care behavior regarding decreasing iron accumulation in the body of children with thalassemia at Nan Hospital, Thailand. The literature reviewed for this study were medical documents, research papers and other related literature, as discussed in the following order;

1. Development and self-care behaviors of the school-age children and the adolescence
2. Thalassemia
3. Iron overload in thalassemia
4. Self-care of children with thalassemia regarding decreasing iron accumulation in the body of children with thalassemia
5. Learning and Operant conditioning theory
6. Teaching program

Development and self-care behaviors of the school-age children and the adolescence

1. Development of the school-age

The school-age children are between 6 and 12 years of age.

Chanaim (1998) was divided school-age children into two age groups. One is the early school-age children (6-10 years); two is the late school-age children (10-12 years). Marlow (1998) was divided school-age children into three age groups. One is age 6-8 years. Two is 8-10 years, and three is 10-12 years. Development of the school-age children as such;

1.1 Biological development

During school-age children growth in height and weight assumes a slower but steady pace as compared with the pre-school children. The

average of height and weight of boy and girl at age 8 to 10 years old are 125-130 cm and 25-30 kgs, respectively.

1.2 Cognitive development

Concrete operation is cognitive development of children at this age which will motivate them to learn the new things. Language skill, children are able to speak clearly, develop a communication by speaking and children improve on writing skill. Children develop a good reading skill (Chordas, 2003).

1.3 Emotional development

Emotional of early school-age children is not consistent and they are very self center. Middle school-age child and late school-age child are learning to control emotion. The early school-age children are prefer the complement from other people, but they do not like competition and being reject from group of friends (Scipien, Chard, Howe, & barnard, 1990).

1.4 Social development

Most likely, school-age children listen to their friends more than teacher or other grown up (Putnam, 1987). During the early school years there are few gender different in the play experiences of children, both girls and boys share games and other activities. How ever, in the late school years the different in the play of boys and girls becomes more marked (Winkelstein, 2005).

2. Self-care behavior of school-age children

Self-care behavior of school-age children based on Orem (1995) is following;

Age 6 years old - Children are able to use toilet by them self but against take a shower. They need to remind about clean hand before meal. They are able to get dress and un-dress by them self. They place toy and cloth back to the same place after used. They are able to help parent in few things such as wipe the floor, clean dish and water plant, etc.

Age 7 years old - Children at this age almost completely take care of them self, they only need a little help from parent. They are able to get dress, un-dress, take a shower, comb hair and go to bed by them self. But they need to remind about wash hand before meal and still leave cloth in the floor after undress. The ability on take cares of them self not as quickly as children at age 8 years old.

Age 8 years old - Children at this age has high confident and interesting to learn new things. They are able to get dress and un-dress quickly. Also, they are able chosen food base on reason more than early age. They have responsibility on their housework such as wipe floor, clean dish, etc. They are preferred to get a prize after their housework done. They are also able to clean their cloth.

Age 9 years old - Children are able to take good care of them self. But they still need to remind on toothbrush. Boy will not pay attention on dirty cloth. On the other hand, girl is very pay attention on cleaning especially cloth. They have responsibility on housework and other complicate work.

Age 10 years old - Children at this age do not like take care of them self and do not like take order. Their room is mess and leaves cloths all over the place. Do not like to do laundry. Have to remind about take a shower and cook some easy meal such as fry egg, boil egg and cook rice, etc.

Age 11 years old - Children in this age are need independent and able to take good care of themselves. They are always against the rule, do not like to go to bed and get up early in the morning. But they are able to be baby sit when their parent not home.

Age 12 years old - Children at this age are highly confident and need more independent. They are starting to worry about their body shape. Boys are take shower more often and dress in more clean cloth. Girls are paying more attention on them cloth.

3. Developmental of adolescence

Adolescence is a transition period when children enter adulthood with complete physical, intellectual, emotional, and social development. Erickson was divided adolescence is between 13-20 years of age. Chanaim (1998) was divided into three phases of early adolescence (13-15 years old), middle adolescence (15-18 years old) and late adolescence (19-21 years old).

3.1 Biological development

Adolescence begins to have physical changes including sexual and hormonal function to enter puberty. For male adolescence, their height increase, and they develop body muscles. For female adolescence, their breasts become fully developed, and their menstruation starts.

3.2 Cognitive development

Piaget's theory of cognitive development (Piaget cited in Whaley & Wong, 1995) holds that development is systematic, sequential, and orderly. Early adolescence is still in the concrete phase of thinking. Middle adolescence ability to think in abstract terms has increased. Adolescence is able to operate in both formal and un-formal operations (Ashwill & Drosked, 1997).

3.3 Emotional development

Adolescence is a period of emotional development in terms of identity and confusion. This is the time when adolescence search for identity and have anxiety about appearance. They are experience role conflicts between children and mature phase (Pukboonme, 1997). Age of critical is meaning for children of this age (Kaewkungwan, 1997; Chanaim, 1998)

3.4 Social development

Adolescence pays a great deal of attention to development of relationships with peer group. They like to compare themselves to their peer and tend to imitate their peer's behaviors. They need acceptance from their peers and they try to be more independent from their family as well.

4. Self-care behaviors of adolescence

Self-care behavior of adolescence based on Orem (1995) is children at this age are able to understand the health and the sickness on the right statement and ability to perform self-care activity. Therefore, they should receive encouragement, knowledge to develop on their self-care behavior. If children have motivation in use new knowledge for their health. Consequently, they are able to completely and continuous to take care of themselves.

Thalassemia

Thalassemia syndromes is an inherited genetic disease of the blood, it is a disorder that results from abnormalities in the synthesis of the hemoglobin. A decrease synthesis of the hemoglobin (Thalassemia) and/ or abnormalities in the synthesis of the hemoglobin (Hemoglobinopathy) are made abnormal red blood cell and hemolytic anemia. Thalassemia is a single-gene disorder that is passed from parents to child by what is called on autosomal recessive pattern of inheritance.

Autosomal recessive means those who inherit a normal gene from one parent and defective gene from the other are referred to as heterozygous or that individual who inherit. A defective gene from both their mother and father are described as homozygote (Tonpijit et al., 2005).

Cause of Thalassemia

Thalassemia is caused by abnormalities in the synthesis of the hemoglobin. Hemoglobin is a specialized type of compound molecule found in red blood cells, the main function of which is to transport oxygen to wherever it is needed in the body. A molecule of hemoglobin has two parts; heme and globin (Intornkumtornchai, 1998).

Heme is composed of a ferrous (Fe) and porphyrin. Globin is made up from protein called polypeptide. One molecule of hemoglobin has a four polypeptide chain and each polypeptide chain arranged with one heme.

Each polypeptide has a variety type of amino acid arranged on chain. Different type of polypeptide result from that code and number of amino acid. In Thailand, most likely synthesis hemoglobin disorder is caused from disorder of globin. (Wanidchayasetthakun & Mitkul, 1997) such as;

1. A decrease synthesis of the hemoglobin (Thalassemia) is caused by decrease mRNA or abnormality mRNA. If caused from decrease synthesis of the α -chain its called α -Thalassemia, if decrease synthesis of the β -chain, its called β -Thalassemia. Patient has a normal quality of α -chain and β -chain but less quantity than healthy people.

2. Abnormal on structure of polypeptide chain (Hemoglobinopathy), α -chain and β -chain have abnormal quality caused by change code and number of amino acid.

Type of thalassemia

The most common type of thalassemia in Thailand is classified by severity. (Tonpijit, et al., 2005) Such as;

1. Bart's Hydrops Fetalis or Homozygous Alpha-Thalassemia is a most severity of thalassemia. The fetus will be stillborn or the child will die shortly after birth. During pregnancy, symptoms may include toxemia of pregnancy, preeclampsia, edema, abnormal delivery and postpartum hemorrhage.

2. Homozygous beta-Thalassemia (β -thal/ β -thal) is a severe anemia, hemoglobin levels between 3-6 g/dl. Patient may present clinical of anemia at one

year old. Acromegaly, splenomegaly, thalassemia facies and delayed of growth will occur if patient do not receive treatment. Blood transfusion is a treatment for patient has a clinical symptoms, so that when patient in age of teenager and adult will have a complication of iron overload such as cirrhosis, diabetes mellitus and cardiac failure.

3. Beta-Thalassemia/Hb E (β -thal/E) has a clinical symptoms such as a mild, moderate and severe thalassemia similar as homozygous beta-Thalassemia.

4. Hb H Disease (α -thal 1/ α -thal 2, or α -thal 1/Hb CS) has a clinical symptoms such as a mild and moderate thalassemia. The clinical symptoms such as anemia, acromegaly and splenomegaly will occur. If patient has a high fever it will make up rapid drowsiness, clinical of brain and cardiac failure.

Sign and symptoms of Thalassemia

Sign and symptoms of thalassemia based on type of abnormal gene, but important sign and symptoms are follows as;

1. Chronic hemolytic anemia, clinical symptoms are presence as pale, jaundice, fatigue, weakness, acromegaly, splenomegaly and blood in urine.

2. Thalassemia facies are facial bone deformity such as, flat nose, cheek chin and jaw are big, mal alignment of teeth and skull deformity. These abnormal characteristic will stay permanently.

3. Hemochromatosis is the abnormal accumulation of iron in parenchymal organ. Its make a dark-color skin because increase of melanin pigment.

4. Heart problem as a result of anemia and additional amount of iron deposited on the heart, it make patient has an enlarged heart and weakness.

5. The cortex bone becomes thinned leading to pathologic fracturing and distortion of bones in the face and skull, result from increase produce of red blood cell in bone marrow.

6. Hemolytic crisis is the rapid destruction of red blood cell. It make patient rapid anemia and has a severe anemia, often occur after infection into the body.

7. Delayed puberty and hypogonadism cause of the iron deposited in endocrine gland, it make primary gland defect and secondary pituitary defect.

8. Delayed growth cause of chronic anemia and iron deposited in endocrine gland.

Complication of thalassemia

Complication of thalassemia (Torjarus, 2004; Taher, Ismaeel & Cappellini, 2006) is follows as;

1. Gall stone is a most complication in thalassemia cause by increase destruction of red blood cell that make patient has a lot of bile pigment, it make acute cholecystitis. Antibiotic drug and surgery gall bladder is treatment.
2. Congestive heart failure cause by chronic anemia, iron deposited in heart from iron overload, pericarditis and enlarged right ventricle from abnormal of lungs. Supportive treatment and try to cure from cause are used to treatment.
3. Iron overload cause by chronic anemia that results from patient increase inefficiency erythropoiesis and increase absorb iron from gut. In addition, received iron from blood transfusion. All of these are cause will increase iron accumulation in all or organ in the body and make organ dysfunction such as heart, skin, endocrine gland and liver.
4. Infection in thalassemia is occurring easily than normal people. Infection of respiratory and gastrointestinal tract is first cause of dead in thalassemia patient. Especially in patient who splenectomy, it is a high risk to a severe septicemia.
5. Hemolytic crisis is often occurs in Hb H disease. Influenza, malaria, dengue fever and typhoid are cause of hemolytic crisis. Patient has a high temperature, rapid pale, jaundice and blood in urine. High temperature make precipitate Hb H, compound inform Inclusion body to destruction red blood cell. Treatment is try to keep normal temperature, then level of hemoglobin is turn to same level as before infection.
6. Hypoxemia is often in patient who splenectomy. Severity of hypoxemia is cyanosis. Hypothesis of hypoxemia is occurs after patient splenectomy, level of plasma will increase in double. Reticulocyte is compound and easy to have deep vein thrombosis.
7. Extramedullary hematopoiesis is often occurs in liver and spleen, its make acromegaly and splenomegaly. In addition, the mass of bone marrow outside marrow cavity, if mass occur at lumbar spine may be make a spinal cord compression and make a leg paralysis. Radiation therapy and blood transfusion is a treatment.

8. Hypertension Convulsion Cerebral Hemorrhage Syndrome (HCC) means patient has a condition as head ache, hypertension and cerebral hemorrhage after receive continuous blood transfusion. This condition is acute occur during blood transfusion and patient may be dead if maltreatment. Prevention of this complication is given a diuretic drug before patient received blood transfusion and follow up blood pressure during and after blood transfusion.

9. Chronic leg ulcer cause is not clear-cut. Maybe occur by chronic anemia, iron overload or low level of zinc in plasma. Treatment is not has a specific treatment.

Treatment of thalassemia

A new therapeutic option for thalassemia such as Gene therapy is therapy for thalassemia that involve in inserting a normal beta-globin gene into the patient's stem cells. The immature bone marrow cells are the precursors of all other cells in the blood. Therefore, it will produce more Fetal hemoglobin, resulting in increase of hemoglobin. Moreover, oxidative drug and developed a new chelation drug (deferiprone, L1) or anti apoptosis drug is another way to treat thalassemic patient. All of new therapeutic can decrease severity and completely cure in patient with thalassemia. However, this method is still in process of development and experiment only in clinic at the present (Wanachiwanawin, 2006). Guideline for cure thalassemia based on clinical appearance and severity of thalassemia are follow as;

1. Stem cell transplantation is the treatment that patient has approximately 75-92% of chance to completely cure. However, this method will efficiency in patient with recently diagnosis received a few blood transfusions and receives a whole of leucoreduce packed red cell (LPRC) and regular iron chelation. Criteria for this therapeutic patient must have severe thalassemia, relative donor identical of a histocompatibility (HLA), budget 500,000-1,500,000 baht and referral to professionals in pediatric bone marrow transplant (Tonpijit et al., 2005).

2. Blood transfusion to decrease hypoxia in patient with thalassemia. Two objections of blood transfusion are follow as;

1. High transfusion - The high blood transfusion should recommendation for patient who has a severity of thalassemia it will cure anemia. This transfusion scheme should regular blood transfusion every 2-4 weeks in dose 12-15 ml/kg, keep the

hemoglobin level in 11-12 g/dl and pre transfusion hemoglobin level do not lower than 10 g/dl. Patient will healthy, normal growth, decrease iron absorb from gut, delayed enlargement of the spleen and prevention deformity of facial bone.

2. Low transfusion - The low blood transfusion should recommendation for patient who has a moderate severe of thalassemia or patient with severe of thalassemia who does not receive high transfusion and patient who has low level of hemoglobin after infection. This transfusion is considering as supportive treatment. Therefore, patient will receive regular or irregular transfusion. It will result in iron from transfusion, increase absorb iron from gut and enlargement of spleen (Tonpijit, et al., 2005).

3. Iron chelation - Indication of chelation therapy is after 10-20 transfusions or when ferritin level rises above 1000 ng/ml (Cao, et al., 1997). These therapies will protection from complication of iron overload such as Diabetes Mellitus, cirrhosis and cardiac failure. Desferrioxamine is a chelation drug it has a good quality, safety and had been useful along time.

4. Splenectomy - Hypersplenism is status of spleen enlargement and resulting in increase blood cell (red blood cell, white blood cell and platelet) destruction. Indication to treat patient with splenectomy is spleen enlarged more than of 6 cm, frequency transfusion and requirement blood more than 200-220 ml/kg/year (Eleftheriou, 2003).

5. Folic acid drug - Patient with thalassemia will synthesis blood cell more than healthy people. So they requirement a lot of folic acid. However, patient who received high transfusion has not to take folic acid.

6. General health care for thalassemia patient are including eat five nutrients, avoided iron in food and drug, follow up vaccine, avoid over exercise, avoid and careful about infection.

7. Treatment follow by occur complication are including gall bladder, cardiac failure etc.

Iron Overload in Thalassemia

Iron overload are diseases caused by the accumulation of iron in the body. It is the most complication in thalassemia and has a variety severity different by type of

thalassemia. Iron overload is important to decide end of life of patient with thalassemia. Iron overload effect to degenerate into important organ in the body especially heart and liver.

The important of iron in the body

Iron is an essential mineral. It is a part of hemoglobin which have a function follow as; (Wiratsethasin, 2003)

1. Iron is a central to transport gas. Iron is a part of hemoglobin it has a function by transport oxygen from lung to the body cell. In addition, iron is also a part of myoglobin, which helps muscle cells store oxygen.
2. Iron is a part of enzyme reaction. Without enough iron, adenosine triphosphate (ATP; the fuel the body runs on) cannot be properly synthesized.
3. Iron is a part of synthesized Thyroid hormones, connective tissues, neurotransmitter and immune system.

Balance of Iron in the body

Iron in the body divide into the three parts, follow as;

1. Iron in the body, more than 80% found in red blood cell, it is a part of hemoglobin. Another inform of myoglobin and compound of enzyme such as Catalase and Peroxidase.
2. Iron storage in the body, 30% storage in liver, 30% in bone marrow and another storage in spleen and muscle. Iron storage in the body informed of ferritin and hemosiderin.
3. Iron in blood circulation. Iron is compound with protein transferin such as iron from gut transfer to organ which synthesis blood cell. In addition, iron is in blood circulation inform ferritin. The human body has a very limit ability to excrete iron. Normally iron to excrete by stool 1 mg/ml and excrete a little by respiratory, sweat and skin. Woman who breast feeding or menstruation period excrete iron 1 mg/day. Iron balance maintained by limiting gastro-intestinal iron absorption, 1-2 mg/day (Coleman, 2005). Iron absorption increase in case of losing iron out of body and ineffective erythropoiesis.

Cause of Iron Overload in Thalassemia

1. Increase iron absorb from gut. Ineffective erythropoiesis is caused by increase iron absorb from gut. In addition, increase synthesis ineffective erythropoiesis

which increase iron absorb from gut. Normally adult absorb iron 1-1.5 mg/day but in thalassemia absorb iron 3-4 mg/day. Iron storage in the body, it make add iron storage in the body 1-2 g/year so that patient with thalassemia in age of adult has a high iron storage in the body although receive a little of blood transfusion (Tonpijit, 2001). Thalassemia patient who has a splenectomy, that appear increase iron absorption and has a severe iron overload.

2. Blood transfusion, in 1 ml of red blood cell has iron 1.16 mg., so that patient who received packed red cell 100-200 mg. will has iron 116-232 mg. (Cao, et al., 1997; Tonpijit, et al, 2005). Patient who received regular blood transfusion will has a high of iron into the body.

Clinical appearance of Iron Overload

Iron overload in thalassemia is chronic iron toxicity. Clinical appearance of iron overload in thalassemia follow as; (Wanachiwanawin, 2001)

1. Dark-color skin and more dark-color skin in severe case.
2. Congestive heart failure
3. Cardiac arrhythmia, especially ventricular arrhythmia. In case of severe case may be occurs ventricular tachycardia and ventricular fibrillation, that resulting patient sudden dead.
4. Insulin-Dependent Diabetes Mellitus, in severe case may be occurs complication is ketoacidosis.
5. Hypogonadism, so that patient delayed puberty, delayed menarche and secondary amenorrhea.
6. Cirrhosis is rare occur on sign and symptoms of cirrhosis. Dysfunction of liver is appeared by blood chemical test and patient has a severe dysfunction if patient with hepatitis B.
7. Infection is often occurs in patient with thalassemia and iron overload is a cause.

Evaluation of Iron Status

Evaluation of Iron Status has many methods, but it is no one method is satisfaction. Normally used at least two methods or more than two methods (Phutrakul, 2001; Wanachiwanawin, 2001) as follow;

1. Estimation method, it is estimate from blood transfusion for patient who received frequency blood transfusion. Calculation from whole of blood, a unit of blood has iron 200-250 mg. If patient has a level of hemoglobin 10 g/dl on pre-transfusion, so that patient has a little iron absorption. Method of calculate is reverse blood to quantity of hemoglobin and reverse to quantity of iron, by used principle of hemoglobin 1 gram has iron 3.4 mg.

2. Calculation of iron in plasma or serum (Serum iron, SI) and total iron binding capacity (TIBC) so that calculation percentage of saturation of transferin as follows;

$$\text{Percentage of saturation of transferin} = \frac{\text{SI}}{\text{TIBC}} \times 100$$

Normal rate of saturation of transferin is 30-40%.

Patient is on condition of iron overload, SI is increase and TIBC is decrease and saturation of transferin is increase more than 60% - 100%.

3. Serum ferritin estimation. Serum ferritin is a protein, it is associate with a quantity of iron in the body in healthy. Serum ferritin is increase when iron overload and decrease when iron deficiency. Normal rate in healthy is 20-200 ng/ml, if iron overload serum ferritin is more than 300 ng/ml. Serum ferritin in iron deficiency less than 20 ng/ml.

4. Calculation ferritin by red cell ferritin. This method is fine to calculated iron overload because it has a little disturbance except patient receive blood transfusion.

5. Twenty-four-hour desferrioxamine-induced urinary iron excretion. This method is injected chelation drug dose 0.5 gm. through muscle or subcutaneous, after that measure iron by collecting urine. Healthy has iron 2 mg/24hr, iron overload has more than 4 mg. Limitation of this method is iron from measure is not associate with iron storage at liver.

6. Directly measure iron by liver biopsy. Measure by chemical test, histochemical test and pathologic of liver such as cirrhosis. This method is accuracy to calculated iron because measure directly iron from liver. Limitation of this method is make patient hurt and patient has a complication.

7. Method by Imaging such as Computed tomography, nuclear resonance scattering, Magnetic resonance imaging (MRI) and magnetic susceptometer.

8. Estimation iron overload by evaluation function of organ such as Echocardiographys, Exercise cardiac radio nuclide angiograph.

9. Lutinizing hormone in Gonadotropin releasing hormone and function of liver by blood chemical test.

Treatment of Iron Overload

1. Chelation therapy

1.1 Desferal therapy (Desferrioxamine) is a siderophore produces by *Streptomyces pilosus* in order to pick up iron from the environment. Desferal therapy started after the first 10-20 transfusion or when the ferritin level rises above 1,000 ng/ml. Route of administration is slow subcutaneous infusion over 8-12 hours, dose is 20-50 mg/kg/day, using infusion pump and use 5-6 day/weeks (Forget & Cohen, 2005). And administration by Continuous Intravenous Infusion, continuous over 24 hours. Indication for use desferal therapy is problem of heart from iron overload, patient in pregnancy and has a level of serum feritin above 2,500 ng/ml, patient who receive bone marrow transplant has serum feritin above 2,500 ng/ml and patient who unable receive desferal chelation through injected at subcutaneous (Cao et al., 1997). Effect of Desferal therapy help patient long live and have a normal life. Prevention delayed growth and decrease severity of congestive heart failure and cirrhosis. Side effect of drug is inflammation injected area and neurosensory toxicity. In addition, side effect of drug is infection *Yersinia enterocolitica*, anaphylaxis and abnormal of bone, but these found in a little (Wanachiwanawin, 2001). Patient who has received desferal therapy should evaluation of iron status in the body for prevent toxicity and avoided side effect.

1.2 Oral chelation. Limitation of desferal therapy is expensive of drug and infusion pump and administration of drug (Continuous Intravenous Infusion) is cause by patient do not cooperate which stop treatment or irregular treatment. These is a reason to develop oral chelation (Defriprone or L1), drug will catch with iron and excrete by urinary. A studied reported that oral chelation has efficiency to decrease iron it storage at heart, but limitation of drug has a severe side effect such as Agranulocytosis, sign and symptoms of joint like a lupus erytmatosus, nausea and

vomiting (Cohen, Galanello, Pennell, Cunningham & Vinchinsky, 2004). Therefore drug is not extensively use to chelation. In Europe, drug is permitted to use as second line monotherapy in dose 75/kg/day for patient who not used desferal therapy (Tonpijit, et al, 2005).

1.3 Combine chelation therapy is oral chelation combine with desferal therapy, this objection is decrease side effect. Furthermore it is a high efficiency to excrete iron (Cohen et al., 2004; Kattamis, et al., 2006).

2. Inhibit iron absorption. In developing country, desferal therapy is not to use widespread because of it has a high cost and patient is not received hypertransfusion. Therefore Iron overload is from diet, a research report that many diets can decrease iron absorption from gut such as tennin from tea, soybean milk, egg and flour etc. (Phutrakul, 2544). Telfer, a nutritionist (2003) mention about iron overload in thalassemia is from blood transfusion but increase iron absorption from gut is important part of cause of iron overload.

Telfer (2003) divided iron in the diet into two groups; iron which is widely in present in meat iron and iron which is widely distributed in the diet (non-meat iron). Meat iron is present in red meat such as beef, lamb, pork, chicken and seafood respectively. Iron in seafood such as sardines, cockles and mussels. Animal liver is a very rich source of meat iron. However, avoiding eating a meat is not impossible for children because a meat contains other important nutrients and it is a source of energy in the body. As a result, children can choose a fish or the white part of chicken more than red meat. Because fish or white part of chicken have a less of iron. Non meat iron is widely distributed in the diet, present in chocolate, cereal and bread which fortified with iron, vegetables, fruits, beans and lentil.

Avoiding taking non-meat iron is very difficult, because most of food have a combination of iron. Therefore, they should eat a food which decrease the amount of iron absorbed in to the body. The food is cereals unfortified with iron, product of soy, dairy products such as milk, cheese, yoghurt and tea or coffee. In addition, they must avoiding taking non-meat iron with foods that increase iron absorption. Foods that increase iron absorption such as fruits, juice and vegetable with high vitamin C such as oranges, strawberry and orange juice.

Northern California Comprehensive Thalassemia Center (n.d.) recommend food for children with thalassemia who received regular blood transfusion, avoiding a very high iron sources are found in beef and product of beef. Avoiding taking foods that increase iron absorption. And they should eating food with iron absorption Inhibitors such as tea, coffee, milk and dairy products. The center recommend avoiding taking oyster, pork, liver, beans, peanut butter, tofu, corn flour, infant cereal and cereal fortified with iron, prunes, prunes juice, watermelon, spinach, leafy green vegetables, raisins, broccoli and pea. Moreover, the center recommend they do not cooking in container that made from iron because iron from container can be through food. This recommendation correspond a research, that report children who eat food from iron container had a high serum ferritin than children who eat food from aluminums container. Therefore the one source of iron is cooking in container that made from iron (Anne - Louise & Fairweather-Tait, 2002).

Teerasassawat, Srichun and Sura (2005) mention that thalassemia is a chronic disease, therefore the important to made patient along with thalassemia. It is chosen appropriate diet. Patient with thalassemia who received regular transfusion must have iron overload. Consequently they should avoiding a high iron diet especially in heme iron food such as liver, oyster and shell. And avoiding non-heme iron food with iron absorption enhancer such as oranges, strawberry, broccoli, tomato, pepper and white wine but they can eat separate. They should eat iron absorption inhibitors such as red wine, tea, coffee, potato, product of soy and high folate diet.

Patient with thalassemia can inhibit iron absorption by chosen appropriate diet. Diets are divided in to four types as follow;

1. Heme iron food or Meat iron
2. Non-heme iron food or non meat iron food
3. Iron absorption enhancer
4. Iron absorption inhibitors

Patient with thalassemia avoiding eat meat iron food. Avoiding eat non-meat iron with iron absorption enhancer. But among non-meat iron and iron absorption enhancer could eat separate. They should drink iron absorption inhibitors such as tea and coffee. But coffee is not appropriate for children so that a tea is the best choice for children. A research reported that tea could decrease iron absorption from gut by

drinking tea in everyday (Kaltwasser, Werner, Schalk, Hansen, Gottschalk & Seidl, 1998). In addition, patient should taking antioxidant diet because patient with thalassemia had a condition of oxidative stress. Dhawan, Kumar, Marwaha and Ganguly (2005) studied about level of antioxidant in thalassemia patient. The studied indicated that thalassemia patient must have a condition of oxidative stress. Increase a condition of oxidative stress is a factor to made hemolysis of red blood cell. As a result, antioxidant is the best method to management this condition. Also patient must eat antioxidant diet.

A research reported that children with thalassemia who taking antioxidant had decrease hemolysis of red blood cell. An antioxidant diet such as capsule of curcuma, curcuma had a curcuminiod. Curcuminiod have an action to resist antioxidant. A studied reported that children with thalassemia who take two capsules of curcuma consecutive in three month. As a result, curcuma could help children with thalssemia to decrease oxidative stress. Afterwards in a similar intervention a studied found that five children from eight children have extended age of red blood cell (Pisarnpong, 2005). In the foreign country has an intervention in children with thalassemia drinking a wheat grass juice, a studied found that children with thalassemia have a significantly to decrease a number of receive blood transfusion (Marwaha, 2004).

Therefore, Antioxidant is valuable to decrease hemolysis of red blood cell and extended age of red blood cell. This knowledge was applied to recommend patient with thalassemia in case of patient can provide a capsule of curcuma or wheat grass juice. If patient can not provide a curcuma and wheat grass juice, Tefler (2003) recommend a diet for thalassemia. The diet that should an antioxidant diet, it provide into four type follow as vitamin E (milk, cereal, beans, egg and meat), vitamin C (vegetable, fruit and juice such as oranges, apple, banana, grape and strawberry), carotenoid (vegetable and fruit, it has a yellow color such as carrot, corn, papaya and oranges) and flavonoid (tea and red wine). Tea is a helpful patient to decrease iron absorption and tea is an antioxidant too. Especially green tea is a good source of antioxidant more than U-Long tea and guava tea (Taechasopol & Nimnoi, 2003). They should take a tea for boil in water more than take instant tea because it has a more caffeine and more sugar.

Conclude of therapy of iron overload by non-drug as follows;

1. Avoiding diet and drug fortified with iron.
2. Avoiding meat iron is present in red meat such as beef, lamb, pork, chicken and seafood.
3. Avoiding eat non meat iron with eat iron absorption enhancer.
4. Taking iron absorption inhibitor diet, a high folate diet and antioxidant diet.

Self-care behavior of children with thalassemia regarding decrease iron accumulation in the body

Iron overload is a complication it often found in patient with thalassemia. Treatment is use a drug for excrete iron from the body. Desferrioxamine is a drugs, it has a high quality and widely use to excrete iron. A price of bottle of drug (500mg) is 180- 200 baht. A price of injection pump is 12,000 baht (Wanachiwanawin, Tonpijit, & Sirinawin, 2004). A high cost of treatment is causes for patient so patient do not receive this treatment. Therefore, guideline for this patient is follows up serum ferritin in every 6 month or 1 year. Patients who have cardiac problems from iron overload are considering to treatment by a drug.

Therefore, patients with thalassemia who do not receive iron chelation. They must have a good self-care behavior for a good health. A good health could help patient to decreasing iron accumulation in the body. A correct self-care behavior is help patient control a severity of disease and decrease complication of disease. Which conform a principle of treatment iron overload. The principle of treatment iron overload is treatment before patients have pathology and dysfunction of organ in the body, especially a heart (Wanachiwanawin, 2001). Therefore, how to patients decreasing iron accumulation in the body are from cause of iron overload. Cause of iron overload was absorption iron from gut and received iron from blood transfusion. Also patient avoiding from a cause of iron overload by they do a correct self-care behaviors. A study of Mungunna (1998) studied effect of develop competency about self-care behavior program in patient with thalassemia. The studied found that patient who receive these program have a good self-care behavior and decrease number of receive blood transfusion.

Therefore, patient with thalassemia must have a correct self-care behavior for they have a good health. As a result, patients have decreasing iron accumulation in the body. A correct self-care behavior is follows as;

1. Diet - children with thalassemia should be eats five nutrition for their good health. Thalassemic patient who received high transfusion also have a high risk of iron overload. The treatment is use drug with avoiding taken a meat iron. But in children with thalassemia who receive low transfusion a cause of iron overload is occur by absorption a lot of iron from gut. They do not receive a drug so that they must protect and decrease severity of iron overload from decreasing iron accumulation in the body. Therefore, patients should avoiding taken meat iron such as liver, entrails, red meat cockles and mussels. But in children should not avoiding meat because that meat is one source of energy and good nutrition for children it effect to children's growth. Therefore, they should avoiding red meat and they should eat a fish and white part of chicken. They avoid eating non-heme iron food such as chinese kale, chinese cabbage, spinach, asparagus, broccoli, radish, potato and taro. Avoiding grains such as beans, pumpkin seed, cereal and bread fortified with iron. Avoid to eating green leaf vegetables is hard for children with thalassemia because it is integrate in any diet and it have a folic acid or folate. Folate is a vitamin for synthesis red blood cell in the body and found in leafy green vegetables. Even though, a folate is found in leafy green vegetables but in dark leafy green vegetables have more iron too. Therefore, children should eat leafy green vegetables except dark leafy green vegetables. These were corresponding with pediatrician to recommend children who receive frequency low transfusion and do not received drug. They can take vegetable except leafy green vegetables. Pediatrician caution about taken vegetable with iron absorption enhancer such orange, cantaloupe, strawberry, broccoli, tomato, pepper, tomato juice and prune juice. But they can take separate among vegetable and iron absorption enhancer. Children with thalassemia must take iron absorption inhibitors such as tea, potato chip, cereal unfortified iron, product of soy, egg, milk, yogurt, cheese. In addition, they must take diet with high folate such as rice, green bean, chinese vermicelli, cabbage. And they must eat antioxidant diet such as vegetable, fruit, diet with curcuma and tea it helpful to decrease absorption iron and it is a one source of antioxidant. Especially green tea is a good source of antioxidant and U-long tea. They should choose a tea for

boil in water more than choose instant tea because it has a more caffeine and more sugar.

In the north part of Thailand it has many local foods. Some local food has a high of iron so they must avoid eating. Examples a local food to avoiding are follow as;

1. Nam Ngiew is food with high of iron. Therefore, children avoiding to take blood of animal in Nam Ngiew but in a soup of Nam Ngiew still have blood of animal too. This meal has about 509.6 mg of iron because it has animal blood in recipe (Subchareon, Dewiset & Termwiset, 2001).

2. Kao Ngiew is a rice mix animal blood and pork then steam, eating with vegetable.

3. Lab or minced meat, in northern of Thailand favor to cooking Lab with animal blood. Therefore, avoid to eating Lab with animal blood. They can separate type of Lab by observe color of Lab, Lab with red color has an animal blood.

4. Kang Aom or meat soup because it has a high iron from entrails of pork or beef in soup.

In addition, example of food to avoid eating such as noodle with animal bloods soup, Tom Lud Moo or meat soup and animal liver grill because these food has a high iron from component of liver and entrails of meat in food.

2. Rest - children with thalassemia have abnormal hemoglobin. As a result, children have a chronic anemia. They have a few of oxygen in the body. When they awake they used much of oxygen in the body. And when they sleep the organ in the body used a few of oxygen. Rest by sleeping in children with thalassemia is important so that they should sleep 8-10 hours per night.

3. Exercise - Exercise is important in children with thalassemia. They should moderately exercise and regular exercise because exercise is activate body organ, muscle strength, cell is tense, increase work efficiency of lung, heart and joint. In addition, children have relaxing and fun. The principle of exercise in thalassemia is avoiding more exercise. They do not exercise until they tried because the body used much of oxygen. As the result, exercises to make workload at heart. The sport that have the clash such as high jump, boxing and gymnastic are avoiding in thalassemia. Because thalassemic patient increase produce of red blood cell in bone marrow, it make a cortex bone becomes thinned leading to pathologic fracturing (Torjarus, 2004).

Accident that makes children losing of blood so they must receive blood transfusion it make children have a lot of iron in the body. In case of severe thalassemia type, children could exercise under control by doctor or nurse.

4. Accident - Patient with thalassemia should be careful accident during playing and exercise. Accident is caution such as accident to make loss of blood. And make children have a bone fracture. As a result, make patient has more anemia and they often receive blood transfusion that increase iron accumulation into the body.

5. Protection infection and cleanness - Thalassemia patients have easier to infection because they have abnormal in synthesis immunity. Infections make disease to severity because red blood cells are destroyed. Red blood cell easier to destroy and rapid destroy in 6 - 12 hours if patients have infection (Huttherat & Mahapun, 1995). Therefore, patients have more accumulation iron in the body, so that patient should careful. They should avoiding patient with cold, cough and pneumonia. They avoiding live in crowd and dusts. Look after the clean in the body which take a bath daily two time, cut the nail shortly, washing hand before eating, tooth brush daily at least two time, rinse a mouth or brush the teeth after eating for protect gingivitis and check tooth health two time per year.

6. Observe sign of anemia and sign of infection - Thalassemia patient has hemolysis of red blood cell result to anemia and more accumulation in the body and has easier infection. Therefore, patient should be careful look after themselves observe sign of anemia by observe from conjunctivitis, hand nail and foot nail and observe early clinical of infection. Infection in respiratory tract often found in children with thalassemia (Ketwichit, 1986). Infection in respiratory tract has a clinical such as fever, cough, sneeze, snot and weakness. Infection and fever are make increase break of red blood cell and it a cause of dead if has a severity clinical (Wanachiwanawin, 2001). Therefore, if patient can observe sign of infection should tell parents or teacher and they must have more rest and drink a lot of water.

7. Observe complication of blood transfusion - Patient should observe clinical before and after blood transfusion and immediately to tell nurse when they found abnormal clinical. Complication of blood transfusion is high fever, chill, palpitation, rash, dyspnea, chest and back pain, nausea and vomiting. If patient has a complication and immediately to tell nurse when they found abnormal clinical it helpful to early

treatment and decrease a number of destroy of red blood cell and protect more receive blood transfusion. Normally clinical after receive blood transfusion is cheerfulness, strength and usual to do activity. In addition, patient should record about number of receive blood transfusion it helps to assessment iron in the body for careful iron overload.

8. General health care - Patient should take a drug from a doctor they should stop take a drug by them. Observe sign of side effect of drug and tell parent when it occurs. Thalassaemic patient should caution parents about provide drug are compound with iron from drug store. Cause of anemia in patient with thalassaemia is occurring from abnormal red blood cell.

Learning

Learning means the change in behavior that is a consequence of repeated experience. Learning process occur by three necessary is stimuli organism and response (Gagne cited in Surawattanaboon, 1984; Quinn, 1995).

1. Stimulus means different things or situations that surround the learner such as lesson, slides, activities, textbook, television, VCD. These things will stimulate through the sensory organ such as the skin, eyes, nose, ears, and tongue of the learner that cause the learner to respond to the stimuli. Therefore teaching must plan ahead to determine which stimuli will elicit the desired response in the learning process.

2. Organism means the learner or the respondent to the stimuli who responses after the stimuli is intercepted by the sensory organ. The respondent must interpret the stimuli by analysis, synthesizing and defining. It is hard to explain the intricate process of learning but, in conclusion, while learning a process will develop based on acknowledgement, inspiration, skill, intellectual, knowledge and past experience.

3. Response means action on behavior that a learner exhibits when receiving stimuli. The response can be classified into three types which are

3.1 Response in the form of thought, knowledge analysis, synthesis, and criticism which are exhibit by speech, informing or conclusions.

3.2 Response in the form of feeling, values, which are exhibit through facial expression such as smiling, or showing interest in that which is being taught.

3.3 Response in the form of the exhibition of skill or movement which is exhibit by action such as running or reading.

Operant conditioning theory

Operant conditioning theory of Skinner (1953) this theory is considering in the group of stimulus-response's theory. The operant conditioning's theory, behavior is relating to environment, so emitted of human is depending from consequence of environment at that moment (Aeamsupasit, 2007). On the other hand, human behavior has its consequences. Human will learn from consequence and behavior in the future will base on its consequence.

Reinforcement and Punisher are considering as 2 type of consequence. Reinforcement is behavior that happens from stimulation and have tendency to happen again in the future, so this behavior will happen more frequency or permanently (Skinner, 1971). Punisher is reinforcement from certain behavior and result in suppress the behavior .This theory emphasize a reinforcement (Aiamsupasit, 2007).

Type of reinforcement follow as;

1. Positive reinforcement is stimulus that will increase level of response such as praise, prize and food, etc.

2. Negative reinforcement is stimulus that will decrease level of response such say out loud, hot weather and blame, etc.

The stimulus for behavior also dividing into two groups as well including Continuous reinforcement and Intermittent reinforcement. They are four groups of Intermittent or Partial reinforcement, following;

1. Fixed ratio is a response in reinforced when a given number of response has been emitted.

2. Variable interval is response has been reinforced in the average every five minutes but unpredictably.

3. Variable ratio is reinforcement occurs after an average number of responses but unpredictably.

4. Fix interval is response has been reinforced for sometime only once every certain minutes.

Operant conditioning is applied to use in education technology. Skinner belief about control learning of human it is control by used a tool so that Skinner present

programmed learning (Phumipak, 1980). Education programmed and instruments of teaching are mention of this principle so they try to provide content and arrange content from easy to hard. Learner can learning by themselves and receive reinforcement after succeed of learning (Punmanee, 2003).

Therefore, this study based on operant conditioning theory. Researcher use stimulus, emitted of human and Reinforcement to build nursing intervention inform of education program .The VCD and cartoon book about “Decreasing iron overload with Big and Jane” is a stimulus for children with thalassemia to learning and positive reinforcement immediately after learning by given a praise for children who have interesting to learning and answer question. This program help children has knowledge about decrease iron accumulation in the body affect to have a correct self-care behavior then given positive reinforcement by given praise again for children has a correct self-care behavior.

Teaching program

Teaching program in this study is compound with teaching by using VCD, allow children to ask question then give a summary by using cartoon book. A benefit of this teaching program is learner able to learn by themselves. Learner can participate in the program and receive response immediately. These benefit help teaching program increase effective more than usual teaching (Malithong, 2005). Researcher review process to produce teaching media which VCD and cartoon book follow as;

VCD

Teaching media is important key to learning because it is a tool to transfer knowledge from teacher to student or media use for learner can learning by themselves. Technology changes quickly, as a result to make a high effective innovation of education. Now, innovation education has a variety type, VCD is a one of education innovation, it is development a new teaching media for learner to have effective learning.

Meaning of VCD

VCD is a name calls briefly from Video Compact Disc. VCD is a soft ware use with VCD player which record data in digital mpeg 1, a time of VCD playing is 74 minute and size of VCD is 12 centimeter (Polpuak, 2001).

VCD or Video Compact Disc meaning is record data from video tape record inform of VCD. VCD use with computer or VCD player by file to record in VCD is MPEG1 (Chumnongsin, 2002).

From these meaning summary that VCD or Video Compact Disc is the data record inform CD-ROM which record data by MPEG1 (Motion Picture Expert Group).

The comparison among VCD and another teaching media (Malithong, 2005; Malithong, 1999) follow as;

1. The advantage compares with VCD and video

VCD had advantage compares with video tape. VCD is a small size, high endure and cheap. Video tape has a low endure after frequency playing and the data damage by magnetic field.

2. The advantage compares with VCD and DVD

2.1 Price of VCD cheap than DVD.

2.2 VCD is use standard in world class can solve a problem incompatibility between system of television NTSC and PAL.

2.3 DVD has a code to protect playing with player buy outside area but VCD no have this code.

Process of writing storyboard of VCD

1. Analysis content – although analysis content is make before this step. Scripter must reanalysis for understanding and clearness of content which translate to a picture.

2. Writing outline script is writing summary of outline to arrange situation.

3. Writing storyboard is writing a script and design from content to picture.

4. Writing storyboard of VCD is pick up a storyboard complete arranges picture, short briefly and sound which arrange by outline script.

Role and important of VCD in learning of children

Human behavior is change by affect of response to stimulus. Which teaching media connect to change learner behavior follow by decide of educator. Method of teaching and teaching media is important so that educator should pick up teaching media appropriate with development and age of learner. Method of teaching makes learning and change behavior with effective and durable.

VCD is a method of teaching which learner can learning by them. VCD is a type of teaching media. Malithong (2005) mention a benefit of VCD that high quality than video tape, VCD do not stretch like a video tape, able play in computer and VCD player and easy to clean. In addition, VCD can replay often which learner want, useful long live, data durable and do not destroy by magnetic filed, convenient, save a teaching time, save cost because able remake easier an cheap, easy to publish and widespread to use VCD. Limitation of VCD is one way communication so that learner can not communicate between learning. These are making learner decrease effective learning comparison with two-way communication. Two-way communications help learner to participate and response immediately such as computer assistant instruction (CAI). Now, CAI is widespread to use in education include healthcare team use CAI to teach patient inside and outside country. Even though CAI is teaching with two-way communication but limitation is use CAI with high efficiency computer, CAI must have maintained and CAI use with other software (Malithong, 2005). These are corresponds with Maneewong (2003) mention that no have a perfect media, type of media different with merit and limitation so that educator must should media appropriate identical with learner and enjoy learning.

This study researcher chosen teaching media inform of VCD. Although VCD has a limitation but this media appropriate with this group. This group is children with thalassemia who have a high risk of iron overload. Children in this group do not receive a drug because expensive. The most of children come from poor family. Researcher chosen multimedia VCD is compound with text, sound and cartoon picture to stimulus children to interesting and appropriate of school-age children and adolescent (Villani, 2001).

Teaching by VCD is direct benefit to patient which teaching media is appropriate with age of children, stimulus learning and frequently replay by children. This benefit make children has a good attitude affect to permanent memory. In addition, children have a correct self-care behavior result to decrease iron accumulation in the body and decrease a risk of iron overload. VCD is benefit for nursing intervention to teach patient which complete content and save a time.

Cartoon book

Kuhapinun (2002) get a cartoon book is one kind of book for children. Book for children has especially from other book both writing , picture, color and size of font it appropriate with age of children. A good character of book for children is follows as;

1. Title - Title is first attractive for reader. Title must match with plots which use easy word and trend (Nittayaprasit, 1991).
2. Cover sheet - Cover sheet is attractive to pay attention so that cover sheet must have a colorful, a title and a picture of character or scene of cartoon book (Thongparn, 1983).
3. Size of book - Bigasugee (1991) mention that book for children must fitting for children, page of book is 8-16 pages for 2-5 years old and 16-32 pages for 6-11 years old.
4. Picture and color - Bigasugee (1991) mention that book for children must have picture too important part. Especially in preschool age children must have many picture and a few word, school-age children must have even picture and word.
5. Font - Size of font is important to make a book for children should use black color of font for appropriate with eyesight of children.
6. Language - Use appropriate language with age of children such as easy word and do not use vulgar language and right spelling because children can memory a wrong word (Kuhapinun, 2002).
7. Plots- Plots must have a funny, run interesting and use a less font.

Principle of cartoon book to support teaching

Nakpijit (1987) present a good of picture in cartoon book follow as;

1. A good cartoon book is makes reader understand identical with writer. Picture is simples and picture had characters which do not have a complex character and picture is one goal and had a prominent picture.
2. Type of picture is a picture in photograph, drawing and shade. Color is power for children to favorite and interesting a book. A study of color of a book for children is found that children like a multicolor.

3. A book designer should know about size of picture it make children favorite a book. Student in school-age likes a big picture, medium picture and small picture respectively.

Anesden (1980) present a principle about picture in cartoon book as;

1. Picture is present of movement and real.
2. Picture has a prominent picture is simples and picture had characters which do not have a complex character.
3. Color picture stimulus children than black and white color.
4. A big size of picture is a favorite for children more than a small size.

A benefit of cartoon book to support teaching

A benefit of cartoon book to learning such as (Thammasaroj, 1999)

1. Motivation - Cartoon is one tool to stimulus children learning and enjoys learning.
2. Illustration - A simple cartoon to explain lesson is make children understand but chosen appropriate with goal.
3. Pupil activity - Student drawing cartoon by them, it is reinforce student to creativity.

Benefit of cartoon book to learning is activate and stimulus interesting in children. Children are enjoyed learning and more understanding.

Document and research papers

Thalassemia is a chronic diseases, a correct self-care behavior is an important to support treatment and increase effective of treatment. Self-care behavior decrease severity of disease and decrease complication of thalassemia. Patient who had a right self-care behavior, they must have a right knowledge about disease and self-care behavior too. A study about relationships among knowledge about health care and self-care behavior in school-age children, found that knowledge about health care has a positive relationships with self-care behavior in school-age children (Phumarin, 1992). A study of self-care behavior in school-age children with thalassemia, result that children have a mistake about eat. Most of children eat a liver and blood of animal because of they believe it is maintain blood circulation in the body (Arayapittaya, 1990). This study conform with Thongrat (1998) study perception of health care and

self-care behavior about promote health care in late school-age children with thalassemia. The studies found that children misunderstand perception of complication and severity of thalassemia. Result of these studied showed that knowledge has a relation with self-care behavior. If patient have knowledge of disease they have a right self-care behavior.

Pinjai (1992) studied effects of teaching program on knowledge and self-care behavior of school-age children with thalassemia. Studies found that children have a great knowledge and self-care behavior after receive a teaching program but 43% misunderstand about complication of thalassemia, rest and drug. Natiles (1998) showed that teaching by using video tape about thalassemia and self-care of children with thalassemia in school-age children with thalassemia had a significantly better knowledge and self-care behavior about thalassemia. Nevertheless they misunderstand about exercise, observe anemia and drug. Limjitsomboon (1999) found that teaching by computer assistant instruction (CAI) make children have a great knowledge and self-care behavior about thalassemia more than children who receive routine medical care. Ponsing (1997) studied effect of supportive educative nursing system on self-care deficit of school-age with thalssemia. The studies found that mean score of self-care deficit of the experimental group was significantly lower than control group ($P < 0.001$). Boranmul (2003) studied effect of teaching program with using-group process on self-care behavior in school-age children with thalassemia. The studies showed that teaching program with using-group process can assist school-age children with thalassemia to demonstrate better self-care behaviors.

From above studies indicated that teaching program can make children with thalassemia have more knowledge and better self-care behaviors. However content of knowledge and self-care behavior was appropriate with patients who do not have a complication and limitation of treatment. The teaching program do not have more detailed about complication of disease. Also with research of Yang, Chen, Mao and Lin (2001) this study was to explore the relationships among illness knowledge, social support and self-care behavior in adolescents with beta-thalassemia major. The results showed that scoring in illness knowledge, the best was treatment knowledge, and the worst was the knowledge of complications and symptoms. Therefore, these studied to emphasize iron overload it was an important complication of thalassemia. The

research was studied in children with thalassemia who do not have iron chelation treatment. Also children in these groups were had a high risk to iron overload. Despite the fact that teaching program can not protect them to have an iron overload but these program can help patient decrease iron accumulation in the body. Moreover, they have knowledge of iron overload and they should realize a harmful and carefulness of iron overload.

In this study, researcher is using teaching program to provide information to children with thalassemia. Teaching program compound with teaching by VCD presentation, allow children to ask question then give a summary by use cartoon book. The study efficiently of teaching by VCD was follows as;

Phupata (2001) studied effect of VCD on English knowledge in primary school children. The studied found that children have a great knowledge more than children who receive usual teaching.

Suwannagood (2003) studied effect of VCD on Science knowledge in high school children. The studied found that children have a great knowledge more than children who receive usual teaching.

Sirisarn (2005) reported that children who receive learning physics by VCD had high education achievement than children who receive routine teaching.

Srisung (2005) reported that children who receive learning by VCD had a high grade point average (GPA) than children who receive teaching by routine teaching.

In the foreign country, Stith (2004) showed that teaching by VCD make children had more achieve learning than teaching by routine teaching. Schenker and Roddish (2004) explore satisfaction of teaching food safety by CD-ROM in primary school. The studied showed that teachers have satisfaction to teach food safety by CD-ROM and students have a better learning. Moreover, the reported showed that children age between eight and eighteen live to watch television. Almost children have a television in bedroom, VCD/DVD player and computer respectively (Robert, Foehr & Rideout, 2005).

The studied of cartoon book to provide information to children. Pongjaturawit (1991) studied effect of teaching health care by cartoon book in chronic illness children found that children have more knowledge, good attitude and better self-care behavior more than children received usual teaching. Janejirawattana (1995) reported

that children who receive cartoon book about hospital have a good perception of hospital more than children who do not receive cartoon book.

Children with thalassemia who receive blood transfusion and do not receive iron chelation have high risk to iron overload. If children with thalassemia have a better knowledge regarding decreasing iron accumulation in the body and they will have a right self-care behavior. A right self-care behavior will help children decreasing iron accumulation in the body. Therefore, provide health education is important key for help children with thalassemia to decrease iron accumulation in the body. Teaching program with teaching by VCD, use cartoon book and give a positive reinforcement from this literature review will help children effectiveness to learn. Therefore, researcher interesting to studied effect of this teaching program on knowledge and self-care behavior regarding decreasing iron accumulation in the body in children with thalassemia.

CHAPTER III

METHODOLOGY

This research is quasi-experimental research, two groups pretest-posttest design by Match Paired which studied the effects of a teaching program on knowledge and self-care behavior regarding decreasing iron accumulation in the body in children with thalassemia.

Population and Sampling

The population of the research is school-age children and teenage children are between 7-19 years old. Who received medical care at out-patient hematological clinic and in-patient pediatric unit at Nan Hospital.

The Inclusion Criteria

1. Being diagnosed thalassemia receiving frequent low transfusion (i.e., at least 1 time/month) and not receiving iron chelation.
2. Not having severe complications such as, severe infection, unconscious, for example.
3. Not having histories of psychosis and/or mental disorder.
4. Being able read and write Thai Language.

The Exclusion Criteria

1. Having severe illness during the study intervention.
2. Receiving iron chelation during the process of the study intervention.
3. Moving to receive medical care in another hospital.

Sampling

Purposive sample was used to chosen sample group by base on inclusion criteria as described above. They were divided into the control group and the experimental group. The control group was collecting data until complete after that collecting data in the experimental group. Researcher match pair variable into three groups based on their age are including 7 - 9 years old, 10-12 years old and 13-19 years old. And variable about severity of thalassemia are mild severe and moderate severe.

Effectsize

To calculate effectsize, a formula by Glass, McGraw, and Smith (1981) was used as follow:

$$d = (y_E - y_C) / S_C$$

d = effectsize
 y_E = mean in experimental group
 y_C = mean in control group
 S_C = standard deviation in control group

The average values of the result of a similar study by Pongsing (1997) used to calculate an effectsize as following:

$$d = \frac{30.97 - 39.30}{8.14} = -1.02$$

30.97 = mean of self-care deficit in experimental group

39.30 = mean of self-care deficit in control group

8.14 = standard deviation of self-care deficit in control group

According to Cohen's (1992) power analysis, to achieve power at .80 and $\alpha = .05$ with a large effectsize of -1.02 the sample size should be at least 26 per a study group.

In sum, this study will required totally 52 subjects.

Setting

This study was conducted at out-patient hematologic clinic, and in-patient pediatric unit at Nan Hospital, Thailand. The samples were followed up on Friday at 8.00 -16.00 am. The hematologic clinic had routine medical care as such to check body weigh, vital sign and blood test for hematocrit. Then pediatricians gave diagnosis and provide prescription and advice.

The Hematology clinic has only one nurse to screen the patients and assist pediatrician in medical procedures. Then nurse advised children and parents about medication, future investigation and follow up on the next appointment.

In case of patient with thalassemia who received blood transfusion, they must admit at in-patient pediatric unit because the out-patient unit could not provide blood transfusion. The nurse at in-patient pediatric unit provided blood transfusion and general health care suggestion for children and parents. After finished blood transfusion if children had no complication, children could go home.

Normally, the patients attend at hematologic clinic about 10-15 persons per day.

Instrument

There were two sets of research instruments in this study.

1. Intervention instrument

1.1 The teaching plan about “Decreasing iron accumulation in children with thalassemia” (Appendix A) was developed by the researcher. The content contained signs and symptoms, iron overload, treatment and guidance of self-care behavior for decreasing iron accumulation. The teaching took about 30 - 40 minute. Two teaching media, VCD and a cartoon book, were used in the teaching process.

1.2 The VCD story entitled “Decreasing iron accumulation with Jane and Big” (Appendix B) was developed by the researcher. This cartoon animation was described by short and easy word along with sound and music. The VCD took about 22 minutes. Steps of developing VCD were as follow:

1.2.1 Researcher was reviewed literature from books, journals, researches, interviewing of children with thalassemia and their parents about diet and self-care behavior. Also, interview pediatrician about guidance to treat iron overload, the different of self-care behavior among children with thalassemia who received

blood transfusion with iron chelation and that received frequency blood transfusion without iron chelation. Furthermore, researcher provided essential self-care behavior for children with thalassemia.

1.2.2. Researcher was selected content and essential knowledge of self-care behavior which appropriate for children age. The contents are about definition of thalassemia, sign and symptoms, cause of iron overload and guideline of self-care behavior for decreasing iron accumulation in the body.

1.2.3. Researcher was leading the content to develop VCD. First step developed a VCD by writing a storyboard. Storyboard means a part of content dividing to a frame follow by objection and presentation. The decisions on screen, color, word, picture and sound were made in this step.

1.2.4 The storyboard was validated according to expert's comments and suggestions. These comments were contributed to refine the VCD.

1.3 The cartoon book entitled "Decreasing iron accumulation with Jane and big" (Appendix C) was developed by the researcher. This book was given to children for reviewing at home. The contents included definition of thalassemia, signs and symptoms, cause of iron overload and guidance of self-care behavior for decreasing iron accumulation in the body. This cartoon book has similar content as in VCD.

Content Validity

All instruments were taken to five experts for content validity (Appendix D):

Two pediatricians specialized in thalassemia

Two nurse educators who have experience in research about children with thalassemia

One nurse who have experience in caring children with thalassemia

The instruments were revised according to the experts' comments and suggestions.

Data collection instrument (Appendix E)

2.1 The demographic data interviews asked about personal information such as age, sex, education, previous experience in health education and medical data about type of thalassemia, date of diagnosis and data of essential treatment such as drug, splenectomy and history of illness in one year.

2.2 The interviewing questionnaire of self-care behaviors about decreasing iron accumulation in the body was developed by the researcher. It was composed 30 items;

Item 1-16 - asking eating behavior

Item 17-25 -asking behavior to decreasing iron accumulation in the body

Item 26-30 - asking health behavior

The response task was four rating scale as follow;

Never (1) - children with thalassemia never do it.

Sometimes (2) - children with thalassemia do it sometimes or do it less than 4 days in 1 week.

Frequency (3) - children with thalassemia do it frequency or do it 4-6 day in 1 week.

Everyday (4) - children with thalassemia do it everyday or every time.

Items 1-16, 9, 17, and 20-30 contained positive meaning. The rest contained negative meaning and had to reverse scores before summing.

2.3 The interviewing questionnaire of knowledge about decreasing iron accumulation in the body was developed by the researcher based on literature review. It was composed of 20 items follow as:

Item 1 - what is thalassemia

Item 2-6 - iron overload

Item 7-15 - eating behavior

Item 17-18 - infection prevention

Item 19-20 - assesment of iron overload

The response task contained 3 positions: yes, no, do not know. One point was given to the correct answer and no point for incorrect or “do not know” answers.

The range of scores were between 0 - 20.

Testing the Quality of instrument used in collecting data.

1. Validity

The interviewing questionnaires of knowledge and self-care behavior regarding decreasing iron overload were taken to five experts for content validity as follow:

Two pediatricians specialized in thalassemia

Two nurse educators who have experience in research about children with thalassemia

One nurse who have experience in caring children with thalassemia

Suggestions from the experts were contributed to the refinements of the questionnaire. Content Validity Index was equal to 1. (Appendix F)

2. Reliability

2.1 The interviewing questionnaires of knowledge regarding decreasing iron accumulation in the body

The revised questionnaire was tested in 35 children with thalassemia (including 26 of the control group). The reliability using Cronbach's alpha coefficient was 0.72.

2.2 The interviewing questionnaires of self-care behavior regarding decreasing iron accumulation in the body

The similar process as described above was performed. The reliability was 0.76.

Data collection

Prepare

1. The permission from the Institutional Review Board (Appendix G) the Faculty of Graduate Studies, Mahidol University was requested so that the researcher could introduce herself to the director of Nan Hospital. Therefore, the researcher was able to collecting data in out-patient hematology clinic and in-patient pediatric unit on Friday 8.30 a.m. - 4.30 a.m.

2. The researcher was introduced herself to director of nurse to explain objection research methodology and collecting data despite their permission and cooperation.

3. Preparing a research assistant who was a nurse for interviewing about knowledge and self-care behaviors regarding decreasing iron accumulation in the body in children with thalassemia and clearly caution about the right of human subject.

Process

1. The researcher checked the follow up card from the hematology clinic on Friday. OPD cards were reviewed to determine if the patients met the criteria to be included in this study.

2. The researcher and research assistant approached a subject while the patient was waiting for a medical visit. The purpose of the study was explained to subject and the subject was invited to participate in the study. The consent form was completed after

3. The research process started in the control group first to avoid treat to validity in term of imitation to treatment.

Control Group

1. The consent form was completed after the subject agreed to enter the study. The research assistant interviewed demographic data, knowledge and self-care behaviors about decreasing iron accumulation in the body in children with thalassemia at hematology clinic (pretest). The time used for interviews was approximately 30 minutes.

2. The control group was given an appointment in next four weeks follow-up and did the posttest (posttest).

3. After the posttest, the control group was presented with VCD and given a cartoon book. Thanks were also given for their participation.

Experimental group

1. The consent form was completed after the subject agreed to enter the study. Children with thalassemia were interviewed by the research assessment about knowledge and self-care behaviors about decreasing iron accumulation in the body (pretest) at out-patient hematology clinic. The time used for interviews was approximately 30 minutes.

2. The experimental group was given the teaching program while waiting for blood transfusion. The teaching program was given in a small group of 1-5, taken

approximately 22 minutes. At the end of VCD, subjects were allowed to ask questions. After that researcher reviewed content of VCD by using cartoon book given to the children for reviewing at home. After the teaching, the researcher asked questions and gave praise for the subjects who should good attention on learning and were able to answer the questions.

3. The subjects were immediately posttest by using the interviewing questionnaire of knowledge. The current posttest was not aimed to put into statistical analysis. The result would help assess whether the teaching was effective or not in term of increasing their understanding and knowledge.

4. The experimental group was given an appointment for follow up by phone in two weeks after intervention. The subjects were asked about self-care behavior and given praise for their correct self-care behavioral decreasing iron accumulation in the body.

5. At 4 weeks after intervention, the subjects came to the clinic for routine follow-up. They were re-interviewed by the research assistant about knowledge and self-care behavior about decreasing iron accumulation in the body (Posttest). Then, they were informed the end of this study process. Thanks were given for their participation.

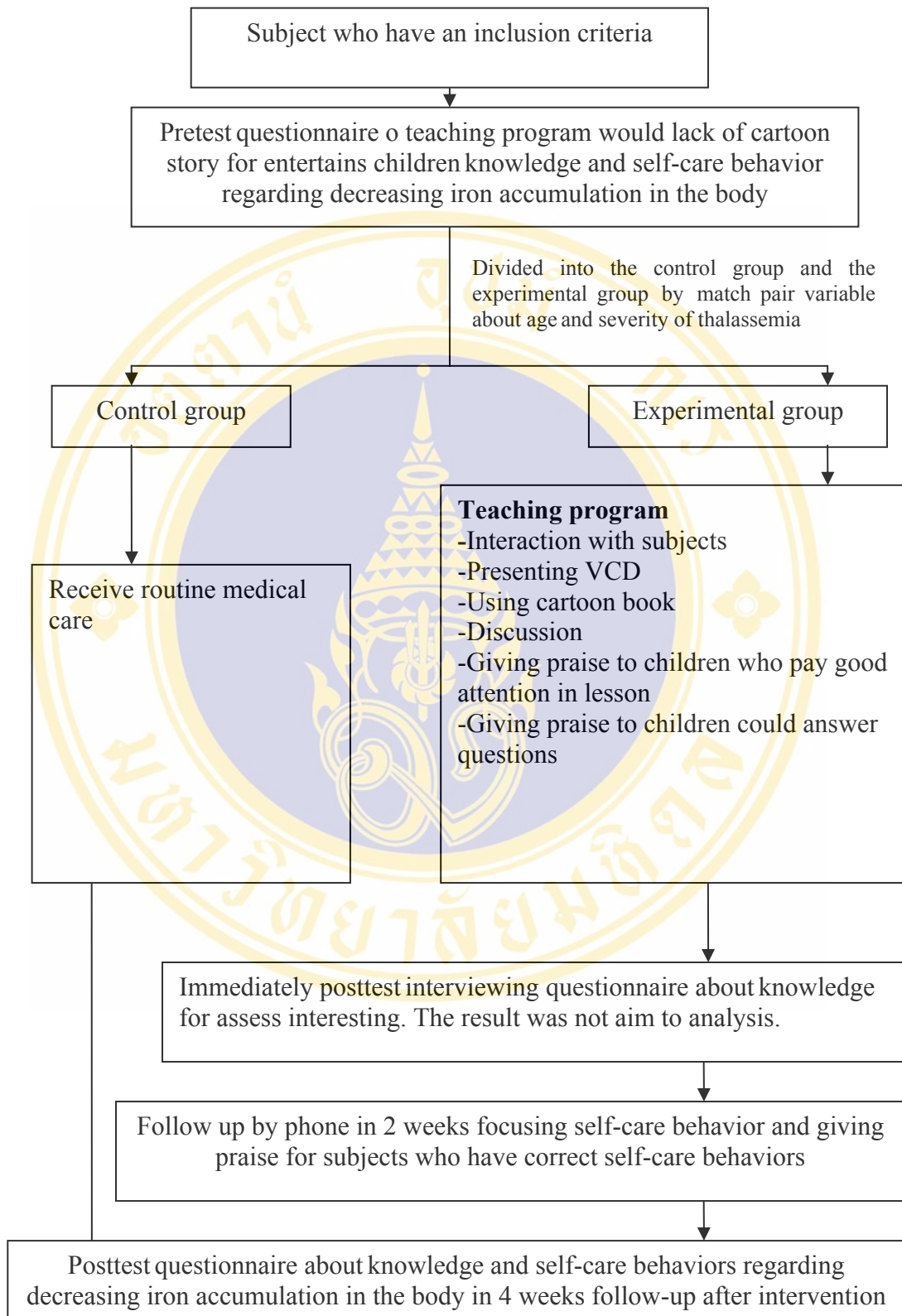


Figure 2. The process of data collection

Protection of Human Subjects

The researcher was undertaken with permission of committee on human rights related involving human subjects, Mahidol University. In process of data collection, the researcher must protect human right of subjects and their parents by explain on the right of their decision to involve or not involve in research program. Also, inform them that it would not effect in medical care from hospital whether what their decision will be. The objective and usefulness from the program must be providing as well. Then consent form would complete after subject agrees to enter the program. Collection data will keep as secret. Overall data would analyze and would not show specific information such as name and address. Moreover, subjects can exclude themselves from research program whenever they want, even thought, some part of data already collected. Finishing the intervention, researcher gave the teaching program to control group for avoiding bias of intervention.

Data Analysis

The computer program was used to analyze the data.

1. Demographic data was analyzed with frequency distribution and percentage.
2. The pretest and posttest scores of knowledge and self-care behaviors regarding decreasing iron accumulation in the body in children with thalassemia were analyzed using mean and standard deviation.
3. The scores of knowledge regarding decreasing iron accumulation in the body in children with thalassemia at pretest and 4-week after intervention (Posttest) between the control group and experimental groups were analyzed using ANCOVA with pretest scores as covariate variable.
4. The scores of self-care behavior regarding decreasing iron accumulation in the body in children with thalassemia at pretest and 4-week after intervention (Posttest) between the control and experimental groups were analyzed by using ANCOVA with pretest scores as covariate variable.

CHAPTER IV

RESULTS

This research is quasi-experimental research, two group pretest-posttest designs by match paired which studied the effects of a teaching program on knowledge and self-care behavior regarding decreasing iron accumulation in the body in children with thalassemia. The sample were 52 thalassemia children aged 7-19 years old who received medical care at out-patient hematology clinic, in-patient pediatric unit at Nan hospital. The samples were divided into two groups as a control group and an experimental group which consisted of 26 children each group.

Experimental group: Children with thalassemia who received the teaching program consisting of watching VCD, allowed asking a question, give praise, summary content by using a cartoon book and children receives a cartoon book to review at home. After two weeks children will be followed up by phone and researcher give praise for their self-care behavior.

Control group : Children with thalassemia who received routine medical care.

The results of this study are presented in tables as follows:

- | | |
|----------|--|
| Part I | The characteristic of the sample. |
| Part II | Description of the score of knowledge and self-care behavior |
| Part III | Results by hypotheses |

Part I The characteristic of the sample.

Most of the children (54%) in the control group were 13-19 years old. Most of children (54%) were female and most of children (54%) were in high school educations. Most of children (96%) had source of information about thalassemia from doctor or nurse. Half of children had a beta-thalassemia (50%). Most of children (50%) had duration of illness 6-10 year. All of children (100%) receive folic acid and Multivitamin for treatment. Most of children (38.5%) had splenectomy 1-3 year. Most of children (11.5%) had infection in history of illness in one year.

Most of the children (54%) in the experimental group were 13-19 years old. Most of children (61.5%) were female and most of children (45%) children were in high school educations. All of children (100%) had source of information about thalassemia from doctor or nurse. Half of children had a beta-thalassemia (50%). Most of children (54%) had duration of illness 11-15 year. All of children (100%) receive folic acid and multivitamin for treatment. Most of children (19%) had splenectomy 1-3 year. Most of children (19%) had infection and bone fracture in history of illness in one year.

After comparing the characteristics of the children in both groups by chi-square test, it was indicated that the children in both groups had not different in age, sex, education, type of thalassemia, duration of illness, treatment and history of illness in one year except source of knowledge information. The results of this characteristic of the sample are presented in tables 1.

Table 1 Demographic characteristics of children (N = 26 in each group)

Characteristic	Control group		Experimental group		χ^2
	n	%	n	%	
Age (year)					
7-9	6	23	4	15	.494 ^{ns}
10-12	6	23	8	31	
13-19	18	54	17	54	
Sex					
Male	12	46	10	38.5	.781 ^{ns}
Female	14	54	16	61.5	
Education					
Primary 1-3	7	27	6	23	.717 ^{ns}
Primary 4-6	5	19	9	35	
High school 1-6 or higher	14	54	11	45	
Source of knowledge about thalassemia					
Doctor/ Nurse	25	96	26	100	.005*
Parent/Relatives	6	23	19	73	
Book/TV/Radio	2	8	0		

* $p < 0.05$, ^{ns} = not significant

Table 1 (cont.,)

Characteristic	Control group		Experimental group		χ^2
	n	%	n	%	
Type of thalassemia					
Beta-thalassemia	13	50	14	54	.1 ^{ns}
Beta-thalassemia/HbE	13	50	12	46	
Duration of illness (year)					
1-5	3	11.5	5	19	.247 ^{ns}
6-10	13	50	7	27	
11-15	9	34.5	14	54	
> 15	1	4	0		
Treatment					
Folic acid	26	100	26	100	
MTV	26	100	26	100	
Splenectomy (year)					
1-3	10	38.5	5	19	.126 ^{ns}
4-6	3	11.5	2	8	
7-10	1	3.8	0		
history of illness in one year					
Blood transfusion	3	11.5	0		.440 ^{ns}
Infection	11	42	5	19	
Bone fracture	2	8	5	19	
Other	3	11.5	2	8	

^{ns} = not significant

Part II Description of the score of knowledge and self-care behavior

The description of scores of knowledge and self-care behaviors regarding decreasing iron accumulation in the body in children with thalassemia in the control and experimental groups at pretest and posttest were shown in Table 2.

Table 2 Means and structural of knowledge and self-care behaviors regarding decreasing iron accumulation in the body in children with thalassemia.

Variables	Pretest		Posttest	
	M	S.D	M	S.D
Knowledge				
Control	11.65	3.773	12.54	2.470
Experimental	12.50	2.404	18.35	1.548
Self-care behavior				
Control	81.54	8.778	82.96	6.347
Experimental	80.65	6.584	101.81	4.436

Part III Results by hypotheses

Hypothesis 1 At four-week after the intervention, the group of children with thalassemia receiving teaching program had higher scores of knowledge about decreasing iron accumulation in the body than that receiving routine medical care.

Upon testing statistical assumption (Appendix H), the ANCOVA was computed. The result showed that the mean scores of knowledge about decreasing iron accumulation in the body in the experimental and control groups were significantly different ($F = 104.561$, $p < 0.05$) at the posttest.

Table 3 Analysis of Covariance of mean score of knowledge at posttest, with pretest score of knowledge as a covariate.

Source	df	SS	MS	F
Pretest score	1	23.029	23.029	5.964
Group	1	403.985	403.985	104.561*
Error	49	189.317	3.864	
Corrected Total	51	650.827		

* $p < 0.05$

Hypothesis 2 At four-week after the intervention, the groups of children with thalassemia receiving teaching program had higher scores of self-care behavior regarding decreasing iron accumulation in the body than that receiving routine medical care.

Upon testing statistical assumption (Appendix I), the ANCOVA was computed. The result showed that the mean scores of self-care behavior about decreasing iron accumulation in the body in the experimental and control groups were significantly different ($F = 199.780$, $p < 0.05$) at the posttest.

Table 4 Analysis of Covariance of mean score of self-care behavior at posttest, with pretest score of knowledge as a covariate.

Source	df	SS	MS	F
Pretest score	1	334.772	334.772	14.087
Group	1	4746.936	4746.936	199.780*
Error	49	1164.278	23.761	
Corrected Total	51	6116.308		

* $p < 0.05$

CHAPTER V

DISCUSSION

The result of the study showed that the effects of a teaching program on knowledge and self-care behavior regarding decreasing iron accumulation in the body in children with thalassemia, then it would be followed by the results of hypotheses testing.

Hypothesis I

At four-week after the intervention, the group of children with thalassemia receiving teaching program had higher scores of knowledge regarding decreasing iron accumulation in the body than that receiving routine medical care.

Result of this study, from hypothesis I, had been supported. It was found that at four-week after the intervention, the group of children with thalassemia receiving teaching program had higher scores of knowledge regarding decreasing iron accumulation in the body than that receiving routine medical care with a statistically significant difference $F = 104.561$, $p < 0.05$. These results can be discussed below.

Children in control group received a routine medical care. A routine medical care consisted of body weigh assessment and vital signs checking as well as blood test for hematocrit. Afterwards, diagnosis, prescriptions, and advice were given to children by the pediatrician. Then the nurse advised children and parents about medication, future investigation and follow-up appointment. In case of children with thalassemia who received blood transfusion, they must receive blood transfusion at in-patient pediatric unit. The nurses at in-patient unit provided blood transfusion and general health care suggestion for children and parents. Routinely, the suggestion and guidance of self-care behavior were provided to the patients and parents at the first visit and teaching by verbal or document sheet. No special intervention had been provided afterwards. Therefore, children lack of knowledge regarding decreasing iron

accumulation and teaching by verbal or document sheet did not stimulate school-age children and adolescent to interesting (Maneewong, 2005). In addition, Hematologic clinic had no room for health education. When children received a health education from nurse (children could see other people and heard other noise). So, it disturbed children to learning.

In experimental group, in-patient pediatric unit had no room for health education, too. Therefore, researcher should teach children by VCD in the corner of in-patient pediatric unit. This corner was not privacy so that researcher use a curtain to protect the children from seen other people and decreasing a disturbance from noise and parents. Teaching program via VCD was important key to teach health education for children. The VCD stimulated through the sensory organ as eyes and ears of the learner that caused the learner to learning. Researcher prepared the content and arranged from easy to hard. Moreover, researcher applied the content as a cartoon story for entertain children.

From review study about effect of teaching program for children with thalassemia such as Pinthong (1992) used flip chart as a teaching program. It was contained of flip chart represented by cartoon picture and giving lecture from researcher but lack of sound and picture movement to stimulate children to have a good attention. Natiles (1998) taught by using a video tape represented children as a performer. So teaching program would lack of cartoon story for entertains children. Therefore, in this study the researcher taught by using VCD. VCD compounded with text, sound and cartoon picture to stimulate children interesting and appropriated for school-age children and adolescent (Villani, 2001). Teaching by VCD would direct benefit to patient when teaching media was appropriate to children's age. This benefit helped children having good attitude affect to permanent memory. A benefit of cartoon would provided children with more enjoyable learning and understanding (Thammasaroj, 1999).

Nowadays, VCD widely used in education. Many studies of VCD reported that children have effective learning by VCD. Sirisarn (2005) reported that children who receive learning physics by VCD had high education achievement than children who receive routine teaching. Srisung (2005) reported that children who received learning by VCD had a high grade point average (GPA) than children who received teaching by

routine teaching. And Stith (2004) showed that teaching by VCD made children having more achieved learning than teaching by routine. Furthermore, VCD was used in health education conforming by Davis, Quittner, Stack and Yang (2004). Their study effectiveness of teaching by CD-ROM about cystic fibrosis in children and adolescent resulted that the children increasing in knowledge and competence of coping strategies. Khongim (2008) studied effectiveness of teaching by VCD about asthma prevention of children for mother who had children at risk for asthma. It found mother in experimental group had a score of knowledge and preventive behavior significantly higher than control group ($p < 0.001$). In this study, teaching with VCD was different from other studies because a content of VCD was a cartoon story about how to decrease iron accumulation and emphasize about local food in the northern part of Thailand.

After children watched VCD, researcher summary by using a cartoon book and then researcher allowed children to discussion. Interaction between teacher and learners had benefit for children, it made children learn better learning (Yunipan, 1992). Therefore, this teaching program was giving in a small group of 1-5. In a small discussion group, there was teacher and learner interaction, hence it would by two-way communication. Between learners or learners and teacher would enhanced the process of learning due to the fact that the learner directly participated in the learning process and received immediate and correct feedback (Hoozer et al, 1987). The benefit of learning with group process was help learners with similar problem can show empathy to each other. Therefore, it is leading learner to the sense of moral support, hope, and motivation to learn. As a result, the teaching goal would be achieved (Yunipan, 1992). This research is applying operant conditioning theory by Skinner (1953) to use as conceptual framework. Teaching by VCD would stimulate children having knowledge regarding decreasing iron overload. Then, researcher used immediately positive reinforcement by giving praise to children who pay good attention in lesson and giving praise to children could answer questions.

Children in experimental group received a cartoon book to review at home. Therefore, they could read the cartoon book whenever they had problem and whenever they want. Benefit of cartoon book to learning was activated and stimulated interesting in children. Children ware enjoyed learning and they had more understanding so they

had more knowledge regarding decreasing iron accumulation in the body more than control group.

Other factor for learning in both group, the result of the comparison of demographic data about age, sex, level of education, type of thalassemia, duration of illness, treatment and history of illness in one year between the control and experimental group have no statistical significant differences in characteristics of the subjects between two groups (Table 1). Therefore, the variable of demographic data on knowledge in both of groups had a similar mean score level. Except the demographic data about source of knowledge about thalassemia in experimental group was significantly differences in characteristics of the subjects when comparison between two groups.

For these results, the interesting point indicated that parent played an important role to make children having more knowledge. But the researcher believed that this teaching program effects on knowledge of children because the content at this study focused in decreasing iron accumulation in the body more than routine health education. Furthermore, researcher analyzed data by ANCOVA statistical method with the utilization of pretest scores as covariate variables. Therefore, this variable was no effect on result of teaching program on children's knowledge.

For these reason, when comparing the mean scores of knowledge at four-week after the intervention, the group of children with thalassemia receiving teaching program had higher scores of knowledge regarding decreasing iron accumulation in the body than that receiving routine medical care with a statistically significant difference.

Hypothesis II

At four-week after the intervention, the groups of children with thalassemia receiving teaching program had higher scores of self-care behavior regarding decreasing iron accumulation in the body than that receiving routine medical care.

The results of this study, in hypothesis II, had been supported. It was found that the groups of children with thalassemia at four-week after the intervention, the groups of children with thalassemia receiving teaching program had higher scores of

self-care behavior regarding decreasing iron accumulation in the body than that receiving routine medical care with a statistically significant difference $F = 199.780$, $p < 0.05$. These results can be discussed below.

Suwan (1983) describe that individuals behavior result from the three factors which were knowledge, attitude, and psychomotor. If either one of the factors happen to change, it would result in a change in an individuals behaviors. Therefore, children had received teaching program by VCD. VCD was important key to learn because was a tool to transfer knowledge about their disease and about how to act. Hence, children with thalassemia received a correct knowledge, they would had the correct attitude and would result in how they act. This knowledge confirmed with the study of Pinjai (1992), her study was effect of teaching program about thalassemia on knowledge and self-care behavior in school-age children. The result found that children have a better knowledge and self-care behavior. Natiles (1998) found that effect of teaching by video tape in school-age children with thalassemia had a better knowledge regarding thalassemia, self-care behavior and suitable for their health.

In control group, children received health education from nurses. The nurses taught or provided suggestion to children about future investigation, follow up on the next appointment and general health education via verbal or a document. From Maneewong study confirmed that teaching by this was did not stimulate school-age children and adolescent to interesting (Maneewong, 2005). In addition, children lack of knowledge about decreasing iron accumulation. Therefore, the factor of knowledge had no change, children with thalassemia would not know how to act in decreasing iron accumulation.

In experimental group had received the teaching program. Using VCD stimulate children to understand knowledge regarding decreasing iron accumulation in the body. Teaching by VCD was direct benefit to children which teaching media were appropriate with children's age. VCD was compound with text, sound and cartoon picture. A Cartoon was one tool to stimulate children enjoyable learning (Thammasaroj, 1999). Therefore, children had a good attitude affect to persistence knowledge and affect to correct self-care behavior to decreasing iron accumulation in the body. After VCD section, children would allow ask questions and researcher would gave a praises for children. A positive reinforcement made children change

their self-care behavior (Skinner, 1953). In addition, children received a cartoon book to review at home. They could read the cartoon book whenever they had problem or they wanted. All of process of this teaching program enhanced children with thalassemia to learn a correct knowledge and promote the changes in self-care behavior. These results could be discussed below;

1. Teaching by VCD, stimulated children to understand knowledge regarding decreasing iron accumulation in the body. This benefit made children having a good attitude affect to permanent memory. Consequently, children had a correct self-care behavior affect to decrease iron accumulation in the body and decrease a risk of iron overload. In experimental group received a teaching by VCD. VCD is compound with text, sound and cartoon picture to stimulate children to interest and appropriate for school-age children and adolescent (Villani, 2001). The teaching program was giving in a small group of 1-5. The benefit of learning with small group process was help learners with similar problem and show empathy to each other. Therefore, it leaded learner to the sense of moral support, hope, and motivation to learn. As a result, the teaching goal would be achieved (Yunipan, 1992).

2. Reinforcement- This study was applied operant conditioning theory by Skinner (1953) for a conceptual framework of study. Teaching by VCD stimulated children having knowledge regarding decreasing iron overload. Then, researcher used immediately positive reinforcement by giving praise to children who paid good attention in lesson and giving praise to children who could answer questions. Effects of positive reinforcement would make children had a response to changed their self-care behavior. The operant conditioning's theory, behavior is relating to environment, so emitted of human is depending from consequence of environment at that moment (Aeamsupasit, 2007) Reinforcement is a type of consequence including Continuous and Intermittent reinforcement. Therefore, after at two-week teaching by VCD researcher used positive reinforcement by encouraging and giving praise, then phoned call follow-ups. Effects of positive reinforcement would make children sustained their correct self-care behavior. In this study, researcher found a problem about phone call follow-up in school-age children. It was children shy to interaction by phone call follow-up with researcher. Therefore, the solving of this problem, the researcher used

a close answer or guidance question for children to choose the choice or answer yes or no.

3. Cartoon book - Children received a cartoon book to review at home. Therefore, they could read the cartoon book whenever they had a problem and whenever they wanted to read. Benefit of cartoon book to learning is activated and stimulated interesting in children. Children were enjoy learning and they had more understanding. Cartoon book was able to entertain children and provided information such as self-care behavior in the same time (Janejirawattana, 1995).

For these reason, when comparing the mean scores of self-care behavior at four-week after the intervention, the groups of children with thalassemia receiving teaching program had higher scores of self-care behavior regarding decreasing iron accumulation in the body than that receiving routine medical care.

CHAPTER VI

CONCLUSION

Summary of the study

This research was a quasi-experimental research study with two group pretest-posttest design by match paired aiming to examine the effects of a teaching program on knowledge and self-care behavior regarding decreasing iron accumulation in the body in children with thalassemia.

The sample of this study were 52 thalassemia children aged 7-19 years old who received medical care at Hematological Clinic, Out Patient Department of Nan Hospital and at the In Patient Department, Pediatric Department of Nan Hospital. The sample was selected with purposive sample and was divided into the control group and the experimental group. The control group was collecting data until complete after that collecting data in the experimental group. The control group receives routine medical care and the experimental group receive teaching program. The data were collecting from May until November 2008.

The instrument used in this study was intervention of teaching program: plan of teaching program which presents by VCD and cartoon book. The data collection instrument consisted of the demographic data from, the structural interviews thalassemia children about knowledge and self-care behavior about decreasing iron accumulation in the body and collecting data by research assistant. The data was analyzed by using chi-square, mean, standard deviation and ANCOVA. Result from this study shown that:

1. Most of the sample in both experimental groups and control group were age 13-19 years and the most level of education was high school. All of samples in control group and experimental group had experience of receive education about thalassemia. Most of source of knowledge about thalassemia were receive from doctor or nurse. Most of duration of illness was 6-10 year in both groups. All of samples in control

group and experimental group receive multivitamin (MTV) and folic acid. Most of splenectomy were 1-3 year in table 2.

2. At four-week after the intervention, the group of children with thalassemia receiving teaching program had higher scores of knowledge about decreasing iron accumulation in the body than that receiving routine medical care with a statistically significant difference ($p < 0.05$) in table 3.

3. At four-week after the intervention, the groups of children with thalassemia receiving teaching program had higher scores of self-care behavior about decreasing iron accumulation in the body than that receiving routine medical care with a statistically significant difference ($p < 0.05$) in table 4.

Implication and Recommendation

The results of this study indicate that the teaching program improved knowledge regarding decreasing iron accumulation in the body of children with thalassemia. The results in the group receiving the teaching program present a greater improvement than the control group. Referring to findings of this study, the following implementations are recommended

1. Implication for nursing practice

2.1 The teaching program was giving in a small group, watching VCD, at the end of VCD children allowed to ask question and they would receive a cartoon book to review at home. Result of this program in a greater improvement in children's knowledge and behavior, compare to usual health education. Therefore, nurse should take this teaching program to provide health education to children with thalassemia. The teaching program will focus on provide information about iron overload and how to decrease level of iron accumulation. Therefore, this teaching program appropriate with thalassemia children who can not afford iron chelation treatment.

2.2 Nurse should use positive reinforcement as a tool in nursing care for children. Positive reinforcement is stimulus that will increase level of response. Therefore, nurse should ask about self-care behavior and giving praise for children who have correct self-care behaviors.

2.3 This teaching program can use which other setting such as out patient department while children are waiting for doctor visit.

2. Implication for further study

2.1 There should be a study of long-term effects of an education program with continuous follow up. The study may measure knowledge and behaviors in children with thalassemia who are the sample of the study every three months, six month, or one year to examine the persistence of the knowledge.

2.2 This study measure effective of a teaching program which knowledge and self-care behavior regarding decreasing iron accumulation in the body. Therefore, there should be measure effective of teaching program on a serum ferritin of children with thalassemia. The level of serum ferritin indicated that how much children has an iron in the body. Or should be measure effective of teaching program which a number of receive blood transfusion every three months, six month, or one year. Decreasing number of receive blood transfusion may be help patient extend time to receive the blood transfusion and save the cost.

2.3 There should be a study of effective of teaching program in parents and preschool-age children.

2.4 A source of information about knowledge from parent is important to help children to learn. There should be a study of effective of parent to participant with children in teaching program.

2.5 The model of this teaching program could be applied to the children with other chronic illness.

2.6 The model of this teaching program could be applied to teach children in other part of Thailand by applied content of local food.

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APPENDIX A

TEACHING PLAN

“Decreasing iron accumulation in children with thalassemia”

แผนการสอน

เรื่อง	การชะลอภาวะเหล็กเกินในผู้ป่วยเด็กโรคธาลัสซีเมีย
วัตถุประสงค์	เมื่อสิ้นสุดการเรียนการสอน ผู้ป่วยเด็กโรคธาลัสซีเมีย <ol style="list-style-type: none"> 1. มีความรู้เกี่ยวกับการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกาย 2. มีพฤติกรรมการดูแลตนเองที่ถูกต้องในการชะลอการสะสมเหล็กในร่างกาย
กิจกรรมการสอน	<ul style="list-style-type: none"> - เปิด VCD ให้ผู้ป่วยเด็กโรคธาลัสซีเมียศึกษาด้วยตนเอง - เปิดโอกาสให้ผู้ป่วยเด็กโรคธาลัสซีเมียซักถามข้อสงสัย - สรุปเนื้อหาโดยอธิบายรายละเอียดจากหนังสือการ์ตูน
สื่อการสอน	<ul style="list-style-type: none"> - VCD เรื่อง ชะลอภาวะเหล็กเกินกับเงินและบีก - หนังสือการ์ตูน เรื่อง ชะลอภาวะเหล็กเกินกับเงินและบีก
ขั้นตอนการสอน	<ol style="list-style-type: none"> 1. สร้างสัมพันธภาพกับผู้ป่วยเด็กโรคธาลัสซีเมีย 2. สอนการดูแลตนเองในการชะลอการสะสมธาตุเหล็กในร่างกายโดยเปิด VCD ให้ผู้ป่วยเด็กโรคธาลัสซีเมียศึกษาด้วยตนเอง 3. เปิดโอกาสให้ผู้ป่วยเด็กโรคธาลัสซีเมียซักถามข้อสงสัย 4. สรุปเนื้อหาทั้งหมดโดยใช้หนังสือการ์ตูนประกอบ
ระยะเวลา	30 นาที

APPENDIX B VCD SCRIPT



ลำดับภาพ	ภาพ	เสียง
1	ชื่อเรื่อง “ชะลอภาวะเหล็กเกินกับเจนและบิก” ภาพบิกและเจน	ชะลอภาวะเหล็กเกินกับเจนและบิก
2	เจนยืนอยู่หน้าโรงเรียน ด้านหลังเจนมีเพื่อนเล่นฟุตบอล	เจน : สวัสดีเพื่อนๆ เราชื่อเจนนะ เรียนอยู่ชั้นป.5 เดี่ยวคุณแม่จะมารับแล้ว ไปตามพี่ชายก่อนกันดีกว่า
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50	คุณหมอขึ้นอยู่ข้างๆ พยาบาลที่แจกหนังสือให้เจนกับบิก	คุณหมอ : สนุกไหม เด็กๆ เจน : สนุกมากค่ะ ได้ความรู้ตั้งหลายอย่าง บิก : ผมจะดูแลตัวเองให้ดีครับ ผมรู้วิธีที่จะชะลอการสะสมเหล็กในร่างกายแล้วครับ
51	เจนกับบิกยืน โบกมือ	เจน : วันนี้เจนกับบิกได้ความรู้เยอะเลย เพื่อนๆ ก็คงเหมือนกัน เจนว่าเรามาเริ่มต้นดูแลตนเองที่ถูกวิธีพร้อมๆ กับเราเลยนะคะ บิก : เริ่มต้นทำตั้งแต่วันนี้เหมือนพวกเรา นะครับเพื่อนๆ เจน: ไปก่อนนะคะเพื่อนๆ สวัสดีค่ะ

APPENDIX C
CARTOON BOOK

“Decreasing iron accumulation in children with thalassemia”



APPENDIX D

LIST OF CONTENT VALIDATORS

The content validity of the instruments used in this study was assured by five validators. Name list of content validators was as follow:

1. Professor Ampaiwan Chuansumrit.
M.D., Faculty of Medicine, Ramathibodi Hospital, Mahidol University.
2. Associate Professor Pimlak Charoenkwan.
M.D., Faculty of Medicine, Chaingmai University.
3. Associate Professor Pornsri Sriaussadaporn.
M.Ed. (Education Research). Faculty of Nursing,
Mahidol University.
4. Associate Professor Sutisa Lamchang.
M.N.S. (Maternal and Child Nursing), Faculty of Nursing,
Chaingmai University.
5. Mrs. Tisarat Kusuwan.
Department of Pediatric Nursing, Siriraj Hospital.

APPENDIX E
DATA COLLECTION INSTRUMENT



เลขที่แบบสัมภาษณ์.....
ผู้ป่วยเด็กรายที่.....
กลุ่ม.....

แบบสัมภาษณ์

ความรู้และพฤติกรรมการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกาย

ส่วนที่ 1 ข้อมูลส่วนบุคคลของผู้ป่วยเด็กโรคธาลัสซีเมีย

ส่วนที่ 2 แบบสัมภาษณ์พฤติกรรมในการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกาย

ส่วนที่ 3 แบบสัมภาษณ์ความรู้ในการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกาย



แบบสัมภาษณ์

สำหรับเด็กวัยเรียนและเด็กวัยรุ่นโรคธาลัสซีเมีย

ส่วนที่ 1

1. ข้อมูลส่วนบุคคล

1. อายุปี.....เดือน
2. เพศ
 - () ชาย
 - () หญิง
3. กำลังศึกษาชั้น
4. ประสบการณ์ได้รับการสอนและคำแนะนำเรื่องโรคและการปฏิบัติตัวเมื่อเป็นโรคธาลัสซีเมีย
 - () ไม่เคย
 - () เคย จากแพทย์ พยาบาล
.....บิดา มารดา ญาติพี่น้อง
.....หนังสือ เอกสาร วิทยุ โทรทัศน์
.....อื่นๆ

2. ข้อมูลทางการแพทย์ (สำหรับผู้วิจัย)

1. ชนิดของโรค
2. วันเดือนปีที่ได้รับการวินิจฉัย
3. การรักษา
4. ประวัติการเจ็บป่วยในระยะเวลา 1 ปี

ส่วนที่ 2 แบบสัมภาษณ์พฤติกรรมการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกาย

คำชี้แจง

แบบสัมภาษณ์ชุดนี้ ต้องการประเมินพฤติกรรมการดูแลตนเองในการชะลอการสะสมเหล็กในร่างกายของเด็กวัยเรียนและเด็กวัยรุ่นโรคธาลัสซีเมีย ผู้วิจัยจะอ่านข้อความแต่ละข้อความให้ผู้ป่วยเด็กฟัง ให้ผู้ป่วยเด็กตั้งใจฟังในสิ่งที่ผู้วิจัยอ่านและคิดให้รอบคอบ แล้วเลือกคำตอบที่ตรงกับกรปฏิบัติกิจกรรมของเด็กมากที่สุด แต่ละข้อความ มีคำตอบให้เลือก 4 คำตอบ คือ

ไม่เคยปฏิบัติ	หมายถึงผู้ป่วยเด็กไม่เคยปฏิบัติตามข้อความในประโยคนั้นๆ เลย
ปฏิบัติบางครั้ง	หมายถึงผู้ป่วยเด็กปฏิบัติกิจกรรมนั้นบางครั้ง หรือปฏิบัติ น้อยกว่า 4 วันในหนึ่งสัปดาห์
ปฏิบัติบ่อยครั้ง	หมายถึง ผู้ป่วยเด็กปฏิบัติกิจกรรมนั้นบ่อยครั้ง หรือเกือบทุกครั้ง หรือปฏิบัติ 4 - 6 วันในหนึ่งสัปดาห์
ปฏิบัติทุกครั้ง	หมายถึงผู้ป่วยเด็กปฏิบัติกิจกรรมนั้นทุกครั้ง หรือเป็นประจำ หรือปฏิบัติทุกวัน

ส่วนที่ 3 แบบสัมภาษณ์ความรู้เรื่องการชะลอการสะสมเหล็กในร่างกาย

คำชี้แจง

แบบสัมภาษณ์ชุดนี้ ต้องการทราบความรู้เรื่องการชะลอการสะสมเหล็กในร่างกาย ของ เด็กวัยเรียนและเด็กวัยรุ่นโรคธาลัสซีเมีย ผู้วิจัยจะอ่านข้อความแต่ละข้อความให้ผู้ป่วยเด็กฟัง ให้ผู้ป่วยเด็กตั้งใจฟังในสิ่งที่ผู้วิจัยอ่านและคิดให้รอบคอบ แล้วเลือกคำตอบที่ตรงกับความคิดเห็นของตนเอง โดยแต่ละข้อความมีคำตอบให้เลือก 3 คำตอบ ดังนี้

ถ้าคิดว่าข้อความนั้น	ถูกต้อง	ให้บอกว่า “ใช่”
ถ้าคิดว่าข้อความนั้น	ไม่ถูกต้อง	ให้บอกว่า “ไม่ใช่”
ถ้า	ไม่แน่ใจหรือไม่ทราบ	ให้บอกว่า “ไม่ทราบ”

APPENDIX F

CONTENT VALIDITY INDEX

การหาค่าดัชนีความตรงตามเนื้อหา (CVI) (บุญใจ ศรีสถิตนรากร, 2547)

CVI =
$$\frac{\text{จำนวนคำถามที่ผู้เชี่ยวชาญทุกคนให้ความคิดเห็นในระดับ 3 และ 4}}{\text{จำนวนคำถามทั้งหมด}}$$

แทนค่า

แบบสัมภาษณ์ความรู้

=
$$\frac{\text{จำนวนคำถามที่ผู้เชี่ยวชาญทุกคนให้ความคิดเห็นในระดับ 3 และ 4}}{\text{จำนวนคำถามทั้งหมด}}$$

=
$$\frac{20}{20}$$

= 1


แบบสัมภาษณ์พฤติกรรมการดูแลตนเอง

=
$$\frac{\text{จำนวนคำถามที่ผู้เชี่ยวชาญทุกคนให้ความคิดเห็นในระดับ 3 และ 4}}{\text{จำนวนคำถามทั้งหมด}}$$

=
$$\frac{30}{30}$$

= 1

APPENDIX G
DOCUMENTARY PROOF OF MAHIDOL UNIVERSITY IRB



COA. No. MU-IRB 2008/016.1308

Documentary Proof of Mahidol University Institutional Review Board

Title of Project: Effects of Teaching Program on Knowledge and Self-care Behavior about Decreasing Iron Accumulation in the Body of Children with Thalassemia at Nan Hospital
(Thesis for Master Degree)

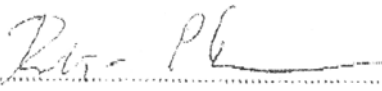
Principle Investigator: Miss Warangkana Mahanil


Name of Institution: Faculty of Nursing

This is to certify That Mahidol University Institutional Review Board is in full compliance with International Guidelines for Human Research Protection such as Declaration of Helsinki, The Belmont Report, CIOMS Guidelines and the International Conference on Harmonization in Good Clinical Practice (ICH-GCP)

Date of Approval: 13 May 2008

Date of Expiration: 12 May 2009

Signature of Chairman: 
(Professor Rutja Phuphaibul)
Vice Chair for Chair

Signature of Head of the Institute: 
(Associate Professor Sansanee Chaiyaroj)
Vice President for Research and Academic Affairs

Office of the President, Mahidol University, 999 Phuttamonthon 4 Rd., Salaya, Phuttamonthon District, Nakhon Pathom 73170. Tel. (662) 8496241-6 Fax (662) 8496247

APPENDIX H

STATISTICAL ASSUMPTION TEST FOR ANCOVA

1. Test for no interaction between the pretest scores of knowledge (covariate) and treatment.

Before using ANCOVA in the data analysis, the assumption was checked; that is, there is no interaction between the covariate and treatment. In the current analysis, an interaction between the pretest score of knowledge about decreasing iron accumulation in the body (the covariate) and the group condition (the treatment variable) was not found ($F = .359, p > 0.05$). Thus, ANCOVA could be applied.

Table 5 Analysis of Covariance of the posttest scores of knowledge with the Interaction between the pretest scores and group conditions

Source	df	SS	MS	F
Group	1	7.595	7.595	.168
Pretest scores	1	26.220	26.220	.012
Group* Pretest scores	1	3.330	3.330	.359 ^{ns}
Error	48	185.987	3.875	
Corrected Total	51	650.827		

^{ns} = not significant

APPENDIX I

STATISTICAL ASSUMPTION TEST FOR ANCOVA

2. Test for no interaction between the pretest scores of self-care behavior (covariate) and treatment.

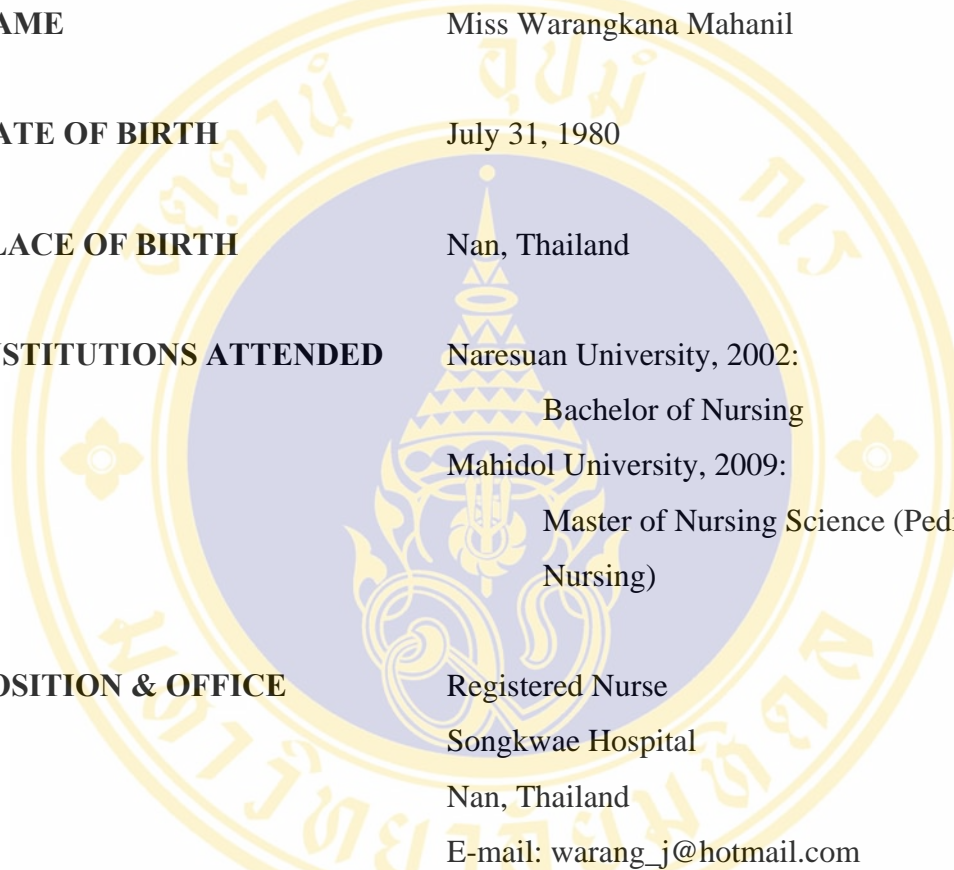
Before using ANCOVA in the data analysis, the assumption was checked; that is, there is no interaction between the covariate and treatment. In the current analysis, an interaction between the pretest score of self-care behavior about decreasing iron accumulation in the body (the covariate) and the group condition (the treatment variable) was not found ($F = 817, p > 0.05$). Thus, ANCOVA could be applied.

Table 6 Analysis of Covariance of the posttest scores of self-care behavior with the Interaction between the pretest scores and group conditions

Source	df	SS	MS	F
Group	1	53.888	53.888	.142
Pretest scores	1	297.345	297.345	.001
Group* Pretest scores	1	1.311	1.311	.817 ^{ns}
Error	48	185.987	3.875	
Corrected Total	51	650.827		

^{ns} = not significant

BIOGRAPHY



NAME	Miss Warangkana Mahanil
DATE OF BIRTH	July 31, 1980
PLACE OF BIRTH	Nan, Thailand
INSTITUTIONS ATTENDED	Naresuan University, 2002: Bachelor of Nursing Mahidol University, 2009: Master of Nursing Science (Pediatric Nursing)
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