

**FACTORS INFLUENCING QUALITY OF LIFE
IN ADOLESCENTS WITH TYPE 1 DIABETES**



**A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF NURSING SCIENCE
(PEDIATRIC NURSING)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2007**

COPYRIGHT OF MAHIDOL UNIVERSITY

Thesis
Entitled

**FACTORS INFLUENCING QUALITY OF LIFE
IN ADOLESCENTS WITH TYPE 1 DIABETES**

Porntip Tachanivate.

Miss. Porntip Tachanivate
Candidate

Autcharaya Patoomwan.

Assist. Prof. Autcharaya Patoomwan,
Ph.D.
Major-Advisor

C. Suprasongsin.

Assoc. Prof. Chittiwat Suprasongsin,
M.D.
Co-Advisor

A. Likitmaskul.

Assoc. Prof. Supawadee Likitmaskul,
M.D.
Co-Advisor

M.R. Jisnuson Svasti.

Prof. M.R. Jisnuson Svasti, Ph.D.
Dean
Faculty of Graduate Studies

Orasa Panpakdee.

Assoc. Prof. Orasa Panpakdee
D.S.N.
Chair
Master of Nursing Science
Faculty of Medicine
Ramathibodi Hospital

Thesis
Entitled

**FACTORS INFLUENCING QUALITY OF LIFE IN
ADOLESCENTS WITH TYPE 1 DIABETES**

was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Nursing Science (Pediatric Nursing)

on

18 May, 2007

Porntip Tachanivate

Miss Porntip Tachanivate
Candidate

Valla Tantayotai

Assist. Prof. Valla Tantayotai
D.N.S.
Chair

Panwadee Putwatana

Assoc. Prof. Panwadee Putwatana,
D.Sc.(Nutrition)
Member

C. Suprasongsin

Assoc. Prof. Chittiwat Suprasongsin
M.D.
Member

J. Jisnusun Svasti

Prof. M.R. Jisnusun Svasti, Ph.D.
Dean
Faculty of Graduate Studies,
Mahidol University.

Autchareeya Patoomwan

Assist. Prof. Autchareeya Patoomwan,
Ph.D.
Member

A. Likitmaskul

Assoc. Prof. Supawadee Likitmaskul,
M.D.
Member

Rajata Rajatanavin

Prof. Rajata Rajatanavin,
M.D., F.A.C.E.
Dean
Faculty of Medicine,
Ramathibodi Hospital,
Mahidol University.

ACKNOWLEDGEMENT

The present study could not have been successfully completed without the assistance of many people. First and foremost, I would like to express my deepest gratitude and sincerest appreciation to my major advisor, Assistant Professor Autchareeya Patoomwan, as well as my co-advisors, Associate Professor Chittiwat Suprasongsin and Associate Professor Supawadee Likitmaskul, for their kindness, understanding, valuable advice, and guidance throughout my program of studies. I am also very grateful to Assistant Professor Valla Tantayotai and Associate Professor Panwadee Putwatana for their constructive comments and supervision that guided this study to the right direction of research.

In addition, I would like to express my profound thanks to Professor Pat Mahachoklertwattana, Director of Pediatric Endocrinology, Faculty of Medicine, Ramathibodi Hospital; Associate Professor Supawadee Likitmaskul, Director of Pediatric Endocrinology, Faculty of Medicine, Siriraj Hospital; Professor Suthipong Wacharasindhu, Director of Pediatric Endocrinology, King Chulalongkorn Memorial Hospital; Assistant Professor Colonel Kwanjai Thanakitcharu, Director of Pediatric Endocrinology, Pramongkutkloa Hospital; and Associate Professor Colonel Phairuch Chaikyakul, as well as all staff members of these four research settings for their cooperation and assistance during data collection. My heartfelt gratitude also goes to all of adolescents with Type 1 diabetes who participated in the study. Without these people, the completion of this research would not have been possible.

My gratefulness goes to Professor Gary M. Ingersoll, Department of Counseling and Educational Psychology and Department of Pediatrics, Indiana University, for kindly allowing me to use his instrument (DQOLY measure), and Associate Professor Dr. Punchalee Wasanasomsithi, for completing the back translation of DQOLY. Also, my appreciation goes to all experts who validated the instruments used in this study. I am also indebted to Assistant Professor Parichard Gooch, Assistant Professor Noppawan Piaseu, and Khun Umaporn Udomsubpayakul for their guidance and invaluable comments with respect to statistical analysis of the data.

My profound gratitude goes to Faculty of Graduate Studies, Mahidol University, for supporting my research Grant for this study

Last but not least, special thanks go to my family, particularly my beloved father and mother, for their greatest love and continued support that have given me the strength I need. I owe my head nurse, as well as all my classmates, who have always been there for me with immense love, support, encouragement, and assistance.

Porntip Tachanivate

FACTORS INFLUENCING QUALITY OF LIFE IN ADOLESCENTS WITH TYPE 1 DIABETES**PORNTIP TACHANIVATE 4536541 RAPN / M****M.N.S. (PEDIATRIC NURSING)****THESIS ADVISORS: AUTCHAREEYA PATOOMWAN, Ph.D.,****CHITTIWAT SUPRASONGSIN, M.D., SUPAWADEE LIKITMASKUL, M.D.****ABSTRACT**

This cross-sectional predictive correlational research aimed at investigating the factors influencing the quality of life (QOL) in adolescents with Type 1 diabetes using Orem's Self Care Model (Orem, 1995) as the conceptual framework of the study. The study sample consisted of 102 adolescents with Type 1 diabetes between 12 and 18 years of age. The subjects were recruited by means of a purposive sampling from the outpatient department of the pediatric endocrinology clinic of Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and Pramongkutkloa Hospital. Data collection took place from March to July 2005. Data were collected using a set of questionnaires which included the demographic characteristics questionnaire, Self-Care Behaviors Questionnaire, and the Diabetes Quality of Life for Youth (DQOLY) Questionnaire. Data analysis included descriptive analysis, Pearson's product moment correlation coefficient, and hierarchical and stepwise multiple regression analyses.

The findings revealed that the mean age of the subjects was 14.7 years, 63.7% were female, and family monthly income ranged from 3,000 to 150,000 baht. In addition, mean duration of diabetes was 61.9 months, and close to three-quarters, or 73.5%, of the subjects had poor metabolic control.

The findings also revealed that the subjects had overall self-care behaviors scores at a rather low level. Moreover, they had a moderate level of satisfaction, impact, and worries scores, and had moderate quality of life scores on the overall DQOLY. Furthermore, half of the subjects rated their own health as good.

Recent HbA_{1c} was negatively correlated with overall DQOLY at a rather low level ($r = -.202$, $p < .05$) and could predict overall DQOLY by 4.1% ($p < .05$). On the other hand, overall self-care behavior was positively correlated with overall DQOLY at a low level ($r = .385$, $p < .01$) and could predict overall DQOLY by another 12% ($p < .001$).

Based on the study findings, nursing implications should include emphasizing HbA_{1c} and self-care behaviors for diabetes management to promote better QOL in adolescents with Type 1 diabetes.

**KEY WORDS: TYPE 1 DIABETES / ADOLESCENTS / QUALITY OF LIFE /
SELF-CARE**

161 pp.

ปัจจัยที่มีอิทธิพลต่อคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1

(FACTORS INFLUENCING QUALITY OF LIFE IN ADOLESCENTS WITH TYPE 1 DIABETES)

พรทิพย์ เตชะนิเวศน์ 4536541 RAPN/M

พย.ม. (การพยาบาลเด็ก)

คณะกรรมการควบคุมวิทยานิพนธ์: อัจฉริยา ปทุมวัน, Ph.D., จิตติวัฒน์ สุประสงค์สิน, M.D.,
สุภาวดี ลิขิตมาศกุล, M.D.

บทคัดย่อ

การวิจัยหาความสัมพันธ์เชิงทำนายครั้งนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยทำนายคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1 โดยใช้ทฤษฎีการดูแลตนเองของโอเร็มเป็นกรอบแนวคิดในการศึกษา กลุ่มตัวอย่างคือเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1 จำนวน 102 คน มีอายุระหว่าง 12-18 ปี ที่มารับการตรวจรักษาที่แผนกผู้ป่วยนอกคลินิกต่อมไร้ท่อในเด็กของคณะแพทยศาสตร์โรงพยาบาลรามาธิบดี โรงพยาบาลจุฬาลงกรณ์ คณะแพทยศาสตร์ศิริราชพยาบาล และโรงพยาบาลพระมงกุฎเกล้า เลือกตัวอย่างแบบเฉพาะเจาะจงตามคุณสมบัติที่กำหนด เก็บข้อมูลระหว่างเดือนมีนาคมถึงกรกฎาคมพ.ศ.2548 เครื่องมือที่ใช้ในการเก็บข้อมูลประกอบด้วยแบบบันทึกข้อมูลส่วนบุคคล แบบวัดคุณภาพชีวิต และแบบวัดพฤติกรรมในการดูแลตนเอง วิเคราะห์ข้อมูลด้วยค่าสถิติเชิงพรรณนา ค่าสัมประสิทธิ์สหสัมพันธ์ของเพียร์สัน และการวิเคราะห์ถดถอยพหุคูณแบบขั้นตอน

ผลการศึกษาพบกลุ่มตัวอย่างมีอายุเฉลี่ย 14.7 ปี ร้อยละ 63.7 เป็นเพศหญิง รายได้ของครอบครัวอยู่ระหว่าง 3,000-150,000 บาท/เดือน ระยะเวลาความเจ็บป่วยเฉลี่ย 61.9 เดือน ร้อยละ 73.5 มีการควบคุมโรคเบาหวานไม่ดี

กลุ่มตัวอย่างมีคะแนนพฤติกรรมในการดูแลตนเองโดยรวมในระดับค่อนข้างต่ำ. การรับรู้คุณภาพชีวิตรายด้าน (ความพึงพอใจ การรับรู้ผลกระทบ และความวิตกกังวล) และคุณภาพชีวิตโดยรวมอยู่ในระดับปานกลาง ร้อยละ 51 ของกลุ่มตัวอย่างประเมินภาวะสุขภาพของตนเองอยู่ในเกณฑ์ดี ค่าระดับน้ำตาลเฉลี่ยต่ำสุดมีความสัมพันธ์เชิงลบกับคุณภาพชีวิตโดยรวมในระดับต่ำ ($r=-.202$, $p<.05$) และสามารถทำนายคุณภาพชีวิตโดยรวมได้ร้อยละ 4.1 คะแนนพฤติกรรมในการดูแลตนเองมีความความสัมพันธ์เชิงบวกในระดับต่ำกับคุณภาพชีวิตโดยรวม ($r=.385$, $p<.01$) และสามารถทำนายคุณภาพชีวิตโดยรวมได้เพิ่มขึ้นร้อยละ 12

การพยาบาลควรให้ความสำคัญกับค่าน้ำตาลเฉลี่ยและพฤติกรรมในการดูแลตนเองเพื่อส่งเสริมให้เด็กวัยรุ่นโรคเบาหวานชนิดที่ 1 มีคุณภาพชีวิตที่ดีขึ้น

CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
ABSTRACT (ENGLISH)	iv
ABSTRACT (THAI)	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER	
I INTRODUCTION	
Background and significance of the study	1
Theoretical framework	5
Research question	16
Purpose of the study	16
Scope of the study	16
Expected outcomes and benefits	17
Definition of Terms	17
II LITERATURE REVIEW	
Type 1 diabetes	20
Adolescents with Type 1 diabetes	24
Self-Care Behaviors of Adolescents with Type 1 diabetes	34
Quality of life and adolescents with Type 1 diabetes	40
Factors influencing on quality of life of adolescents with Type 1 diabetes	55
III METATERIALS AND METHODS	
Population and sampling	61
Instruments	64
Psychometric properties of the DQOLY Measure	67
Psychometric properties of the Self-Care Behaviors Measure	68

CONTENTS (Continued)

	Page
Data collection Procedures	69
Data Analysis	70
IV RESULTS	
Demographic and clinical characteristics of diabetic adolescents	73
Self-care behavior and Diabetes Quality of Life Youth scores	80
The relationships between each of the independent variables	86
The predictors of overall DQOLY	87
V DISCUSSION	
Demographic characteristics of the Subjects	88
Clinical characteristics of the Subjects	90
Caregiving characteristics	93
Diabetes Quality of Life for Youth (DQOLY)	93
Factors Predicting Quality of life of Adolescents with Type 1 Diabetes	98
VI CONCLUSION	
Summary of the Finding	104
Limitations of the study	106
Implications and Recommendations	107
BIBLIOGRAPHY	110
APPENDIX	126
BIOGRAPHY	161

LIST OF TABLES

Table	Page
1 Demographic characteristics of the subjects	73
2 Clinical characteristics of the subjects	76
3 Characteristics Caregivers	79
4 Range, mean, standard deviation and percentage of mean of self-care behaviors	80
5 Range, mean and standard deviation of Diabetes Quality of Life for Youth scores	81
6 Range, mean, standard deviation, and percentage of mean of satisfaction scores of the three highest and lowest item scores	82
7 Range, mean, standard deviation, and percentage of mean of impact scores by three highest and lowest item scores	83
8 Range, mean, standard deviation, and percentage of mean of worry scores by three highest and lowest item scores	84
9 Frequency and percentage of self-rated health	85
10 Pearson's product moment correlation coefficient between gender, family income, duration of diabetes, recent HbA1C, self-care behaviors, and total DQOLY	86
11 Hierarchical and Stepwise Multiple Regression Analysis of gender, family income, duration of diabetes, recent HbA1C and self-care behaviors on total DQOLY	87
12 Frequency and percentage of diabetic Adolescents' self-care behaviors scores	149
13 Frequency and percentage of each Satisfaction item	153
14 Frequency and percentage of each Impact item	155
15 Frequency and percentage of each Worry item	157

LIST OF FIGURES

Figure	Page
1. The relationships among the study variables	15
2. One-Sample Kolmogorov-Smirnov Test	158
3. Normal P-P Plot of Regression Standardized Residual	158
4. Scatter plot	159
5. Assessment for Multicollinearity among Predictor Variables in the model	160

CHAPTER I

INTRODUCTION

Background and Rationale

Type 1 diabetes, formerly known as insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes mellitus (Sacks et al., 2002: 752), is one of the most common chronic endocrine disease of childhood, occurring most commonly during late childhood and early to mid adolescence (Orr, 2002: 252), affecting mostly 10-to-12-year-old girls and 12-to-14-year-old boys (Velasco-Whetsell et al., 2000: 461; Boland & Grey, 2000: 426). Type 1 diabetes is a lifelong chronic and debilitating disease, which affects every organ system (Juvenile Diabetes Research Foundation, 2004). Therefore, Type 1 diabetes is an increasingly important and formidable health problem in the world today (Taylor, 1995: 526).

Currently, there are 3.5 million people who are suffering from Type 1 diabetes worldwide, and the number is expected to increase to 5.3 million in the year 2011 (Bloomgarden, 1998: 860). In brief, the incidence of Type 1 diabetes is increasing rapidly all over the world (Devendra, 2004: 750). The highest annual incidence of childhood Type 1 diabetes in the population aged 14 years or younger was found in Finland (36.5 per 100,000) and Sardinia (36.8 per 100,000), whereas the lowest annual incidence was in China and Venezuela (0.1 per 100,000) (Karvonen et al., 2000: 1516).

In Thailand, although there is no national statistics, the incidence of childhood Type 1 diabetes in the population aged 0-15 years increased from 0.2/100,000 per year in 1984-1985 to 1.65/100,000 per year in 1991-1995, which was similar to the incidence in other countries in Asia (Tuchinda et al., 2002: 648-652). Type 1 diabetes accounted for 93.3% of all diabetes in Thai children, with the peak incidence in those aged 10-14 years (Chanika Tuchinda, B.E. 2542: 3), with girls slightly more susceptible than boys (1.39:1) (Likitmaskul et al., 1999: 826-831).

The main goals of diabetes care in children and adolescents with Type 1 diabetes are to relieve acute symptoms of hyper- and hypoglycemia, and also to reduce the risk of long-term complications which are present in the form of microvascular and macrovascular disorders (WHO, 1999 cited by King, 2003: 1205). Specific goals for the treatment of diabetic adolescences are sustaining good health, promoting normal growth and development (Lowes & Lyne, 2000: 46), promoting optimal school performance (Betschart, 1997: 192), and maintaining the patients' quality of life for as long as possible (Rose, 2002: 35). Quality of life has been increasingly recognized as an important factor in outcome assessment of children and adolescents with diabetes. Type 1 diabetes and its treatment affect adolescents' quality of life at a multidimensional level including physically, psychologically, socially, and spiritually (Spilker, 1996: 2).

Physically, diabetic adolescents who have poor control may be suffering from acute and chronic complications (Lowes & Lyne, 2000: 46). They also experience discomfort due to pain (Jacobson, 1997: 14; Aalto et al., 1997: 222); more physical symptoms from classic hyperglycemia triads including thirst, polyuria, and weight loss (De Sonnaville et al., 1998: 919); increased fatigue; sleep problems (Polonsky, 2000); and more frequent infections (Herman, 1999: 104), all of which worsen their overall health and role functioning (Lyoyd et al., 1992: 166-172; Padgett, 1993: 123-129, cited by Aalto et al., 1997: 222). Impaired growth and delayed pubertal development also occur in adolescents with poorly controlled diabetes (ISPAD Consensus Guidelines, 2000: 102).

Regarding psychological aspects, diabetes can have negative impacts on psychological quality of life associated with fear about diabetes complications, depression, worry, dependence, low self-esteem, social dependency, poor ego development (Grey, Cameron, Lipman, & Thurber, 1994), and the feeling of being different, leading to the need to hide their diabetes from their friends (Kyngas & Barlow, 1995). Phobic disorders such as needle phobias, fear of blood, fear of self-monitoring of blood glucose values, and self-injection of insulin are not uncommon, but when present, they can have a negative impact on diabetic control (Canadian Diabetes Association., 2003: S50), and a greater incidence of depression (Cara, 1999).

Besides these psychological impacts, children and adolescents with diabetes also face social problems and need to cope with an interference with schooling, career choice, leisure activities, and worries about their ability to be an adequate spouse/parent (Kanner, Hamrin, & Grey, 2003: 15). Poor metabolic control and increasing severity of diabetes can lead to frequent and lengthy school absences or hospitalizations. These illness-related events can separate these adolescents from unaffected peers and interrupt their ability to build successful peer relationships and peer supports (D'Auria, Christian, Henderson, & Haynes, 2000: 176), and social isolation are often found in this group (Lloyd et al., 1993: 481-485 cited by Jacobson et al., 1997: 811). The stigma is often seen like delayed marriage or reduced job opportunities (Diabetes Forum, 2004), and all children and adolescents with diabetes are often concerned with the danger of pregnancy and the transfer of the genetic predisposition for diabetes to one's offspring (Harris & Holvey, 1991: 690). Moreover, economic strain from costs of insulin, blood tests, and other medical expenses lead to financial burden. In brief, all of the above negatively impact physical and psychological quality of life. Nevertheless, some adolescents may perceive positive impact of diabetes as an opportunity to achieve a healthy lifestyle choice (Faro, 1999: 249).

Many factors such as gender, family income, duration of diabetes, metabolic control, and self-care behaviors influence quality of life in adolescents with Type 1 diabetes. Gender differences have been noted in the clinical context of diabetes. Males consistently have a better quality of life than females (Verbrugge, 1982: 417-437; Kandrack, et al., 1991: 579-590 cited by Camacho et al., 2002: 784) in both Type 1 and Type 2 diabetes, and females seem to have lower treatment satisfaction and experience a higher diabetes burden (Peyrot & Rubin, 1998 cited by Camacho et al., 2002: 784). The study of the Hvidore Study Group (Hoey et al., 2001: 1923-1928; Cameron, 2003: 132-136) in 2102 diabetic adolescents across 21 centers in 17 countries found that gender was correlated with quality of life and that females showed more worry and less satisfaction than males.

Family income has been found to be positively correlated with quality of life in children with Type 1 diabetes aged 7-20 years (Bangchang Sukcharearn et al., B.E.2545: 78-87) and in school-age children with a chronic illness (Sudjai

Samithtikarn, B.E.2541: 68). Moreover, there is evidence that longer duration of diabetes is associated with deficits in quality of life (Glasgow et al., 1997: 562-567; Aalto, Uutcla, & Aro, 1997: 215-225; Klein et al., 1998: 236-240 cited by Maddigan, Majumdar, Toth, Feeny, & Johnson, 2003). Similar findings were reported in a study of Sudjai Samithtikarn (B.E.2541: 68) that duration of illness in school-age children with a chronic illness was positively correlated with quality of life.

In addition, HbA1c testing is used to determine whether the patients' metabolic control has reached and been maintained within the target range of < 7% (ADA, 2002: S99). Previous studies have suggested that better metabolic control that is measured by low HbA1c is associated with better quality of life. Rubin and Peyrot (1999: 205-218) found that better quality of life is associated with lower HbA1c levels. This result was similar to that of the study by Guttmann-Bauman, Flaherty, Strugger, and McEvoy (1998: 915-918) which investigated the relationship between metabolic control and quality of life in 69 adolescents with Type 1 diabetes aged 10-20 years, pointing out that the Diabetes Quality of Life (DQOL) score was negatively correlated with HbA1c level. In addition to these findings, the Hvidore Study Group also found that lower HbA1c was associated with less impact, less worries caused by diabetes, greater satisfaction, and better health perception for adolescents across many cultures (Hoey et al., 2001: 1923-1928; Mortensen, 2002: 117-120; Cameron, 2003: 132-136).

Lastly, self-care behavior was another factor that has an effect on quality of life. Adolescents with Type 1 diabetes must manage self-care activities to maintain tight glucose control to improve long-term prognosis as recommended in the study of the Diabetes Control and Complications Trial (DCCT) (ADA, 2002: S25-S27). Self-care practice involves the range of activities individuals undertake to enhance health and well-being or quality of life. These self-care activities include daily insulin injection, self-monitoring of blood glucose, a prescribed meal plan, regular exercise, and problem-solving tactics to regulate blood glucose (Wysocki, Greco, Harris, Bubb, & White, 2001: 441), as well as regular contact with healthcare professionals (Songer, LaPorte, Lave, Dorman, & Becker, 1997: 577). Many researchers have found that self-care behaviors influence quality of life of adolescents with diabetes (Banchang

Sukcharearn et al., B.E.2545: 78-87; Harris et al., 2000: 1301; Kyngas & Hentinen, 1995: 729-736).

Thus, quality of life is increasingly being recognized as a useful criterion to assess the impact of treatment of diabetes. As diabetes is a chronic lifelong disease, and it is not curable but only treatable, adolescents with Type 1 diabetes have to live with uncertainty and fear of complications, and they may feel that they are different from their peers. Consequently, diabetes and its treatments have profound impact on adolescents' quality of life and influencing factors change over time throughout their life. It is therefore important for the nurses to assess quality of life of adolescents with Type 1 diabetes to sustain and improve their quality of life. However, little is known about the impact of diabetes and its treatments on quality of life in Thai adolescents with Type 1 diabetes. According to the review of literature, a large number of studies have been conducted in western countries and most of them have attempted to measure the impact on quality of life of adult diabetes rather than children and adolescents. Also, the reviewed literature has shown inconsistent findings regarding factors influencing quality of life among adolescents with Type 1 diabetes. Therefore, the researcher aimed to explore quality of life and determine factors influencing quality of life of adolescents with Type 1 diabetes in order to provide valuable information for nurses who work with this population. The findings of the present study would provide a body of knowledge which is based on factors influencing quality of life in adolescents with Type 1 diabetes which can help nurses to identify at risk groups, formulate realistic goals, and develop specific nursing intervention to improve quality of life of adolescents with Type 1 diabetes and help them go through the unpleasant course of diabetes and its treatment.

Theoretical Framework

The theoretical framework of this study was based on Orem's Self-Care Model (Orem, 1995). Self-care behaviors are the practice of activities that individuals initiate and perform on their own behalf to maintain life, health, and well-being (Orem, 1995: 104). Self-care behaviors mean a deliberate action that is well oriented and is a purposeful goal or result-seeking activity. Deliberate action is always

self-initiated, self-directed, and controlled in regard to presenting conditions and circumstances (Orem, 1995: 229). It is essentially an action to achieve a foreseen result that is preceded by investigation, reflection, and judgment to appraise the situation and by a thoughtful, deliberate choice of what should be done.

The purpose of self-care is to meet three types of self-care requisites: universal, developmental, and health deviation self-care requisites (Orem, 1995: 108-109). Type 1 diabetes is a chronic lifelong and incurable disease. Management of Type 1 diabetes is a complex and lifelong process. Thus, Type 1 diabetes increases complex therapeutic self-care demands of individuals to maintain life, health, and well-being. Therapeutic self-care demands of adolescents with Type 1 diabetes mean the activities of overall self-care to meet these three types of self-care requisites, which are as follows:

1.1 Maintenance of a sufficient intake of food and energy for adolescents with Type 1 diabetes. Adolescents with Type 1 diabetes' nutritional requirements do not differ from those of adolescents who do not have diabetes, nor do they require special foods or different amounts of vitamins or minerals (Wolfsdorf, Anderson, & Pasquarello, 1994: 534). The aims of nutritional management in adolescents with Type 1 diabetes should focus on achieving blood glucose goals (ADA, 2004: S42) that provide sufficient and appropriate energy intake and nutrients for optimal growth, development, and good health (ISPAD Guidelines., 2000: 53). They can be accomplished through individualized food and meal planning, which is based on the exchange system and consistency of daily intake with regular meals and snacks (Boland & Grey, 2000: 433). They must follow weight gain and growth pattern for evaluation of their adequacy of energy intake (ADA, 2004: S42). Moreover, the diet prescription has to be reviewed and adjusted, if necessary, at least every six months to ensure maintenance of a normal rate of physical growth and maturation.

1.2 Maintenance of a sufficient sleep and rest. In general people require six to eight hours of sleep. Sufficient rest will help them recuperate from illness and improve health (Lee, 1997: 617 cited by Chokephichit, 2003: 25). Adolescents with Type 1 diabetes who have a good control should have no sleeping problems. However, those who are hyperglycemic overnight will have difficulty sleeping because of the recurrent need to urinate (Boland & Grey, 2000: 437). Furthermore,

nighttime hypoglycemia (nocturnal hypoglycemia) should be suspected if pre-breakfast blood glucose is low. Nocturnal hypoglycemia leads to confusional states, nightmares, seizures, impaired thinking, lethargy, altered mood, or headaches. These are experienced when waking up during the night (ISPAD Consensus Guidelines, 2000: 79). However, this problem can be managed by improving metabolic control (Boland & Grey, 2000: 437).

1.3 *Practicing exercise appropriate for clinical condition.* All levels of physical activity, including leisure activities, recreational sports, and competitive professional performance, can be performed by persons with Type 1 diabetes who do not have complications and have good blood glucose control (ADA, 2004: S61). It is recommended that individuals should accumulate 30 minutes of moderate physical activities at least three days a week (ADA, 2004: S62). Physical activities benefit health promotion and disease prevention. Preparing individuals with Type 1 diabetes for a safe and enjoyable physical activity program is as important as the physical activity itself. Therefore, adolescents with Type 1 diabetes in good metabolic control can safely participate in most activities (ADA, 2004: S59). Regular exercise has been shown to improve blood glucose control, reduce cardiovascular risk factors, contribute to weight loss, and improve well-being (ADA, 2004: S21).

1.4 *Maintenance of a balance solitude and social interaction.* Adolescents with diabetes should have the same social rights as their non-diabetic peers, and no stigma nor discrimination should be attached to diabetes (ISPAD Consensus Guidelines, 2000: 79). They should have full participation in social and sporting activities and equal opportunities and social rights to education, school, college, and employment (ISPAD Consensus Guidelines, 2000: 117). Adolescents spend a large amount of time with peer at school. Strong peer relationships are fundamental for the development of social skills, a healthy self-concept, future emotional adjustment (D'Auria et al., 2000: 175), and can provide positive role model and group activities during adolescence (National Diabetes Education Program, 2004). Social isolation are frequent in this group because they feel different from their peers (Orr, Golden, Myers, & Marrero, 1983: 170; Lloyd et al., 1993: 481-485 cited by Jacobson et al., 1997: 811). Therefore, adolescents with Type 1 diabetes need support from family, peer groups, school personnel, and healthcare providers.

1.5 *Prevention of hazards to human functioning and human well-being.*

All adolescents with Type 1 diabetes must learn to detect the symptoms of hypoglycemia and diabetes ketoacidosis and learn how to prevent their occurrence and how to perform self-managed care (Boland & Grey, 2000: 432). Moreover, performing self-monitoring blood glucose testing can help them identify the patterns of hypoglycemia and may indicate periods of increased risks. During illness, effective sick-day management is an important for children with Type 1 diabetes. Positive urine ketone tests during illness indicate a need for extra doses and a search for medical attention if they need assistance to adjust insulin (ADA, 1997: S49). In addition, HbA1c testing should be performed routinely in all patients with diabetes and should be in the target range of < 7%. This is because HbA1c level can predict the risk for development of many chronic complications in diabetes (ADA, 2004: S92). Moreover, All diabetic persons should carry high-sugar food with them at all times (at least 15 gm carbohydrates to be eaten or taken in liquid form in the event of a hypoglycemic reaction) and should carry medical identification so that they can be diagnosed and treated appropriately if they lose consciousness while away from home (Boland & Grey, 2000: 432; ADA, 2004: S129).

1.6 *Promoting of normal growth and development in a period of adolescence transitions.* The diabetes management and behavior tasks such as frequent glucose monitoring and insulin injections may also interfere with the child's opportunities for normal development experiences (Sullivan-Bolyai, Deatrick, Gruppuso, Tamborlane, & Grey, 2003: 22). Therefore, a major goal for healthcare professionals who work with adolescents are to promote good diabetes care within the context of a satisfying lifestyle in order to maintain normal growth and development.

1.7 *Seeking knowledge about Type 1 diabetes and securing continuously appropriate medical treatment.* All adolescents with Type 1 diabetes and their families should accept their illness. They must be concerned with taking care of themselves in order to improve and maintain their health (Petcharatna, 2002: 31). Therefore, they should seek information and learn about Type 1 diabetes for proper self-care management and handling of the problems of diabetes care at home (Chase & Eisenbarth, 2003: 979). Diabetes self-management education is the keystone of diabetes care and management, which provides the persons with diabetes with the

knowledge and skills to perform self-care on a day-to-day basis including to assess the relationship among medical nutrition therapy, activity level, emotional and physical status, and insulin therapy and then respond appropriately and continually to those factors to achieve and maintain optimal glucose control (ADA, 2004: S136). Furthermore, effective self-management requires frequent and high levels of educational input and continuing support. In addition, not only do adolescents need to be equipped with knowledge, but they also need empowering and motivating to use knowledge and practical skills in problem-solving and self-care management (ISPAD Consensus Guidelines, 2000: 27).

1.8 Being aware of and attending to the effects and results of diabetes control. Self-monitoring blood glucose (SMBG) is extremely useful for patients who take insulin to assess diabetes control and to adjust management (Zavalkoff & Polychronakos, 2002; 1603). The variability of blood glucose level is influenced by differences in insulin absorption, insulin sensitivity, exercise, stress, rate of food absorption, and hormonal changes (e.g., puberty), illness, traveling, and any change in routine (e.g., increase exercise and a different diet during vacation). Therefore, they may require more frequent SMBG to adjust their treatment regimen under the guidance of a physician (ADA, 2004: S20). SMBG is recommended a minimum of three or more times daily in preprandial and bedtime (Zavalkoff & Polychronakos, 2002: 1603) for adolescents with insulin to monitoring for and prevent complications. In addition, to achieve diabetes control requires optimal use of SMBG, proper interpretation of the data to adjust food intake, exercise, and insulin therapy (ADA, 2004: S20). During illness, it is important that insulin must be continued even if the patients are unable to eat or are vomiting. When accompanied by hyperglycemia, a positive urine test for ketones during illness indicates a need for extra, not less, insulin. They should give information regarding blood glucose values to their healthcare professionals, whenever patients need assistance in handling illness or stress from healthcare professionals (ADA, 2004: S109).

1.9 Being aware of and attending to or regulating the discomfort and deleterious effect of medical care. Diabetic adolescents are required to achieve the diabetes treatment goals by self-monitoring of blood glucose, taking frequent insulin injections, and exercising, in addition to planning diet, foot and oral care, and yearly

screening for visual and renal status (Taylor et al., 2003: 1058). In addition, controlling longitudinal HbA1c levels in a good range of < 7 %, maintaining blood pressure below the 90th percentile for age, and avoiding smoking or chewing tobacco (Chase & Eisenbarth, 2003: 985) are factors that greatly reduce the development and progression of microvascular and neuropathic complications by 50% in those with Type 1 diabetes (ADA, 1993: 977-986; UK Prospective Diabetes Study Group, 1998: 837-851 cited by Taylor et al., 2003: 1058).

1.10 *Carrying out medically prescribed treatment as effectively, correctly and continuously.* All adolescents with Type 1 diabetes are dependent on insulin for survival and have to maintain diabetes control through their life (Kyngas, 2000: 260). They must not stop insulin during sick days (ISPAD Consensus Guidelines., 2000: 74). Daily insulin dosage varies greatly between individuals and changes over time. Therefore, they must learn how to administrate insulin correctly and effectively. The effective use of insulin to obtain the best metabolic control requires an understanding of duration of action of the various types of insulin and relationships of blood glucose levels to exercise, food intake, intercurrent illness, certain medications, and stress, self-monitoring of blood glucose, and learning to adjust insulin dosage safely and effectively (ADA, 2004: S109).

1.11 *Learning to live with the effects of the pathology of the disease or existing conditions peacefully.* Adolescents must realize that their lives will never be the same as before having Type 1 diabetes and learn to live with diabetes for the rest of their life. Throughout the course of diabetes, diabetic adolescents and families rely on healthcare professionals to provide information about health promotion, diabetes management, assistance with the process of adaptation, and recruitment of other psychological or social resources (Amer, 1999: 627). As a consequence, both adolescences or children and their families need the guidance and counseling from healthcare professionals about ways to normalize their lives as much as possible.

1.12 *Seeking and securing appropriate medical assistance.* Adolescents with diabetes can fully participate in the school experience and safety. They need assistance from teachers and friends to manage and treat diabetes emergencies in school. For example, severe hypoglycemia may lead to unconsciousness and convulsions and can be life-threatening if not treated promptly and diabetes

ketoacidosis can be life-threatening and requires immediate medical attention (ADA, 2002: S122-126).

1.13 *Appropriate coping with stress from illness and treatment.* Management of stress is important on a short-term basis because stress hormones increase blood glucose levels. Furthermore, chronic emotional upsets may lead to missed injections or other compliance problems. When this happens, counseling for the diabetic adolescence or children and family becomes an important part of diabetes management (Chase & Eisenbarth, 2003: 982). For this reason, interventions including ongoing psychological support and reinforcement, coping skills training, and family behavior therapy should be offered as appropriately within the context of personal family structure (Canadian Diabetes Association., 2003: S51).

The effectiveness of these self-care behaviors can be determined with the following results: (1) the pathologic process is arrested, or the effects of the disease are kept under control; (2) complicating diseases are prevented; and (3) the dissemination of the causative agents of the disease is prevented (Orem, 1995: 132). The consequence of this effectiveness will contribute to improved health status and well-being, the latter of which is defined by Orem (1995: 101) as a state characterized by experience of contentment, pleasure, and kinds of happiness; by spiritual experiences; by movement toward fulfillment of one's self-ideal; and by continuing personalization. Well-being is associated with health, with success in personal endeavors, and with sufficient resources. Individuals may experience well-being despite adverse conditions, including disorders of human structure and functioning such as adolescents with Type 1 diabetes.

Quality of life

The term 'quality of life' is most commonly used synonymously with well-being and life satisfaction (Andrew & Whitney, 1976; Flanagan, 1978: 138-147; Goode, 1990: 41-57 cited by Puavilai, 2000: 21-22). However, these two terms are not totally equal to quality of life. It is possible that well-being and satisfaction with life may be outcomes or consequences of quality of life (Puavilai, 2000: 22). Life satisfaction has been used as a dimension of quality of life and is one of the principle components of the Diabetes Quality of Life for Youth (DQOLY) measure

(The DCCT Research Group, 1988: 727-728), which is used to assess quality of life in this study. Life satisfaction is also considered an important dimension of well-being in Orem's perspective (Orem, 1985 cited by Hanucharunkul, 1988: 10). Therefore, the term quality of life will be used in the present study.

Basic conditioning factors

Performing self-care for individuals entails both internal and external factors that affect individuals' capability to engage in self-care or affect the kind and amount of self-care required. These factors are called basic conditioning factors including age, gender, development state, health state, socio-cultural orientation, healthcare system factors, family system factors, pattern of living, environmental factors, and resource availability and adequacy (Orem, 1995: 203).

Various demographic variables such as basic conditioning factors may contribute to quality of life (Hanucharunkul, 1988: 3). Some of these factors are gender, family income, duration of diabetes, metabolic control, and self-care behaviors, which are considered factors affecting quality of life in adolescents with Type 1 diabetes, which are shown below:

Gender: Gender is a factor to classify the physical differences of human beings, and it is also controlled by social role (Murray & Zentner, 1989: 5). Besides, it has been identified as an individual factor associated with problem behaviors (Black, Richado, & Stanton, 1997 cited by Rew & Horner, 2003: 381) and coping response (Copeland & Hess cited by Rew & Horner, 2003: 381). Sex differences have been noted in the clinical context of diabetes. Girls enter puberty at an earlier age than boys and have more unsatisfactory blood glucose control for a number of reasons. These may involve decreasing adherence to different aspects of the treatment regimen and decreasing insulin sensitivity of peripheral tissues. These changes in metabolic control may affect QOL differently in male and female patients (Hoey et al., 2001: 1923-1924). In addition, females, as compared to males, appear to experience a greater impact of diabetes on their quality of life and, in particular, experience more worries about complications and hypoglycemia (Jacobson et al., 1997: 11-20). Consistent with a large cross-sectional study of 2102 diabetic adolescents across 21 centers in 17

countries, the Hvidore Study Group has reported that gender is correlated with quality of life (Cameron, 2003: 132-136).

Duration of Diabetes: According to Orem (1995: 203), duration of diabetes in the present study can be defined as the health state. Having diabetes, children must face a lifetime of potential sequelae from chronic illness (Leonard et al., 2002: 28) and the possibility of experiencing debilitating and life-threatening situations from acute and chronic complications if they cannot achieve optimal metabolic control (Jacobson, 1993: 977-986 cited by Guttmann-Bauman et al., 1998: 915). Thus, prolonged illness of living with diabetes and complications can contribute to worsened quality of life. Previous studies (Glasgow et al., 1997: 562-567; Aalto, Uutela, & Aro, 1997: 215-225; Klein et al., 1998: 236-240 cited by Maddigan, Majumdar, Toth, Feeny, & Johnson, 2003) have pointed out that longer duration of diabetes is associated with deficits in quality of life. Similarly, Elbagir et al. (1999: 71) found that increased diabetes duration has a deteriorating effect on quality of life, at least for perception of general health, body pain, and sleep problems. On the other hand, these findings are inconsistent with that of a study by Sudjai Samithtikarn (B.E.2541: 68) which discovered that duration of diabetes is positively correlated with quality of life ($r = .1348$, $r < .05$).

Family income: Family income is an indicator of socioeconomic status (Orem, 1995: 203) and a very important factor for the way of life which can respond to the basic needs and the ability to perform self-care (Pender, 1982: 163). The people with high family income will have more opportunities than people with low family income in seeking facilities for healthy self-care practices (Pender, 1982: 161-162). In addition, availability of socioeconomic resources allows individuals to focus their efforts on becoming well (Weisman, 1979 cited by Hanucharunkul, 1988: 17) and may be related to psychological well-being. Orem (1985: 175) also states that availability of resources will affect the well-being of the family. Adolescents with Type 1 diabetes who have low family income usually have limited resources available to them to facilitate engagement in self-care to meet self-care requisites, thereby contributing to negative health outcomes (National Center for Health Statistics

[NCHS], 2002 cited by Rew & Horner, 2003: 380) and contributing to perceived poor quality of life. Therefore, it is postulated that family income has both direct and indirect influences on quality of life. Banchang Sukcharearn et al. (B.E.2545: 78-87) found that family income is correlated with quality of life ($r = 0.237$, $p = .05$). A similar finding was reported by Sudjai Samithikarn (B.E.2541: 68) that there was a positive correlation between family income and quality of life ($r = .4607$, $p < .001$).

Metabolic control: According to Orem (1995), HbA_{1c} level, as the index of metabolic control (ADA, 2004: S92), can be conceptualized as human condition or health state of adolescents with Type 1 diabetes. Health is also viewed both as a goal of self-care and basic conditioning factor which affects self-care (Orem, 1985, cited by Hanucharunkul, 1988: 152). Therefore, HbA_{1c} level can be used as both health state in basic conditioning factor and health outcome of self-care. In the present study, the HbA_{1c} level is conceptualized as health state, which is one of the basic conditioning factors. In adolescents with poor metabolic control problems, such as chronic hyperglycemia or recurrent diabetic ketoacidosis (DKA), they may have more distressing symptoms and may experience increased health complications, which contributes to a poorer perceived quality of life (DCCT, 1994: 177-188 cited by Delamater et al., 1999: 700). On the other hand, if the diabetic adolescents perceive the positive impact of good metabolic control for their quality of life, this may increase the effort they are willing to invest in self-care in order to maintain a good metabolic control (Aalto, Uutela, & Aro, 1997: 223). Therefore, the differences in metabolic control may affect their perceived quality of life (Hoey et al., 2003: 7-12). A study by Guttmann-Bauman et al. (1998: 915-918) conducted with 69 adolescents with Type 1 diabetes aged 10-20 years found that the Diabetes Quality of Life (DQOL) scores were correlated with the mean HbA_{1c} ($\beta = 6.13$, $R^2 = 0.22$, $P = 0.0122$) and single HbA_{1c} ($\beta = 3.94$, $R^2 = 0.18$, $P = 0.05$). In addition to these findings, the Hvidovre Study Group also found that lower HbA_{1c} is associated with less impact, less worries caused by diabetes, greater satisfaction, and better health perception for adolescents across cultures (Hoey et al., 2001: 1923-1928; Mortensen, 2002: 117-120; Cameron, 2003: 132-136).

Self-care behaviors: According to Orem (1995), self-care behaviors can be defined as the practices or activities that adolescents with Type 1 diabetes initiate and perform on their own behalf in the management of their disease in daily lives in order to maintain life, health, and well-being or quality of life. Adolescents with Type 1 diabetes who perform appropriate self-care behaviors in their treatment regimen are likely to perceive better physical health and mental health outcomes through perceived control or self-regulation. Consequently, they perceive good quality of life. As such, performing self-care behaviors is found to be positively correlated with quality of life (Aalto et al., 1997: 222). Likewise, a study by Kyngas and Hentinen (1995: 729-736) found that adolescents with diabetes who had good self-care behaviors perceived better health and well-being. Furthermore, Banchang Sukcharearn et al. (B.E.2545: 78-87) also found that self-care behaviors in children and adolescents with Type 1 diabetes aged seven to 20 years are correlated with quality of life ($r = 0.446$, $p = .001$).

In summary, basic conditioning factors of gender, family income, duration of diabetes, metabolic control, and self-care behaviors are related to quality of life of adolescents with Type 1 diabetes. Previous studies have also revealed that these factors can also be used to predict quality of life of adolescents with Type 1 diabetes.

From the above conceptual framework, the relationships among the variables in this study can be summarized and depicted in Figure 1 below.

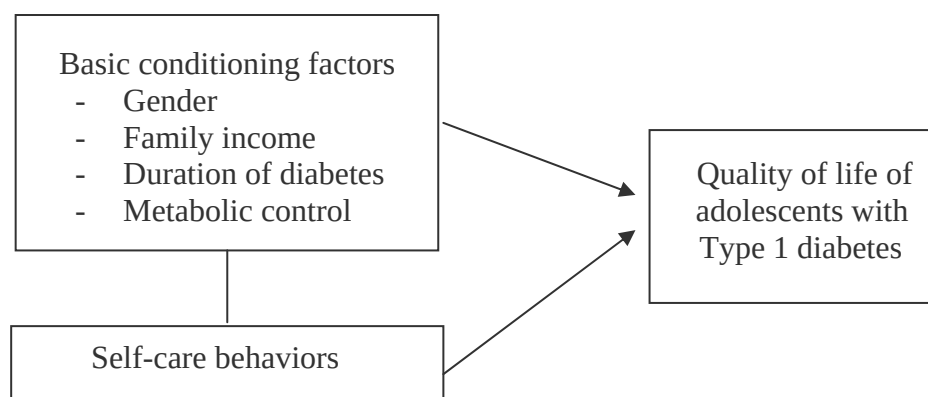


Figure 1: The relationships among the study variables

Research Questions

1. What is the level of quality of life of adolescents with Type 1 diabetes?
2. Can adolescents' self-care behaviors and basic conditioning factors including gender, duration of diabetes, family income, and metabolic control predict quality of life of adolescents with Type 1 diabetes?

Purposes of the Study

1. To describe the level of quality of life of adolescents with Type1 diabetes
2. To determine whether adolescents' self-care behaviors and basic conditioning factors including gender, duration of diabetes, family income, and metabolic control can predict quality of life of adolescents with Type 1 diabetes

Research Hypothesis

Adolescents' self-care behaviors and basic conditioning factors including gender, duration of diabetes, family income, and metabolic control can predict quality of life of adolescents with Type 1 diabetes.

Scope of the Study

The purpose of this descriptive research was to predict adolescents' self-care behaviors and basic conditioning factors including gender, duration of diabetes, family income, and metabolic control on quality of life of adolescents with Type 1 diabetes. The subjects of this study were 102 adolescents who had Type 1 diabetes, aged between 12 and 18 years, and visited the Pediatric Endocrinology Clinic, Out-Patient Department of Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and Pramongkutkloa Hospital. Data were collected by means of questionnaires between April and July 2005.

Expected Outcomes and Benefits

1. The findings of this study would shed light on knowledge about factors influencing quality of life in adolescents with Type 1 diabetes.
2. The findings of this study could also be used as baseline knowledge for establishment of a nursing intervention program to promote and improve quality of life of adolescents with Type 1 diabetes.
3. The findings of this study could also be used as a guideline for further research on other issues related to quality of life of adolescents with Type 1 diabetes.

Definition of Terms

Gender refers to the male or female gender of adolescents with Type 1 diabetes.

Family income refers to the amount of money that parents or either one of the parents, if divorced or widowed, receive from work (Baht/month). If the caregiver is not the parent of a diabetic adolescent, family income will be calculated by the amount of money that each caregiver receives from work (Baht/month).

As regards economic status, it can be categorized as follows:

Adequate and with no savings means the income is enough to pay for all needs but none is left for savings.

Adequate and with some savings means the income is enough to pay for all needs with some left for savings.

Inadequate or indebted means the income is not enough to pay for needs and they are in debt.

Duration of diabetes refers to the duration of time in months since the adolescent have been diagnosed with diabetes and have received treatment at the pediatric endocrinology clinic until the time of the study.

Self-care behaviors refer to the performance of eight activities by adolescence with Type 1 diabetes that are carried out to meet their own therapeutic self-care demands including the activities of personal hygiene care, dietary control,

medication intake, physical activity, self-monitoring, problem solving, stress management, and reduction of risks of diabetic complications. The self-care behaviors questionnaire used to gather data was developed by the researcher based on Orem's nursing model (Orem, 1995) and the Diabetes Self-Management Education Core Outcomes Measures (Mulchy et al., 2003). It consists of eight subscales with 38 items. The level of self-care behaviors was assessed using a composite score of the following items: 1) number of the last seven days individuals performed the diabetes self-care behaviors in daily life (items 1 to 17), with each item rated with an eight-point rating scale from 0 to 7; and 2) frequency of performing diabetes self-care behaviors with the following events happening to the subjects in the last three months (items 18 to 38), with each item rated with a six-point rating scale from 0 to 5 (no events happening at all to always). Higher scores indicate good self-care behaviors, while lower scores indicate poor self-care behaviors.

Metabolic control refers to the ability of the physiological process to change food and minerals into living matters and produce energy by chemical processes. Thus, HbA_{1c} levels are used as an index of metabolic control, based on the recommended classification of ADA (American Diabetes Association, 2002: 99) as follows:

HbA_{1c} < 7 % = Good control

HbA_{1c} 7-8 % = Fair control

HbA_{1c} > 8 % = Poor control

The HbA_{1c} values are determined at the laboratories of each multi-center, all of which use the Immuno Turbidimetric method.

Quality of life refers to perceived satisfaction with life with diabetes treatment of adolescents with Type 1 diabetes, as well as their worries related to diabetes and its impacts on daily life that affect their physical, psychological, and social well-being as measured by Diabetes Quality of Life for Youth (DQOLY), a modified version of the Diabetes Quality of Life (DQOL) for specific use in adolescents by Ingersoll and Marrero (1991). This instrument consists of three subscales: 17 items on diabetes life satisfaction scale, 23 items on disease impact scale, and 11 items on disease-related

worries scale. Each item is arranged in a five-point Likert Scale. Satisfaction is rated from 1 (very satisfied) to 5 (very dissatisfied). Impact and worry scales are rated from 1 (never) to 5 (all the times). Higher scores indicate a lower quality of life, and vice versa. A general self-rating of overall health is also included, arranged in a 4-point Likert scale (Poor = 1, Fair = 2, Good = 3, and Excellent = 4), with higher scores reflecting positive rating of personal health.



CHAPTER II

LITERATURE REVIEW

This predictive correlational research aimed to determine adolescents' self-care behaviors, basic conditioning factors including gender, duration of diabetes, family income, and metabolic control that influence the quality of life of adolescents with Type 1 diabetes. The Literature review was undertaken by reviewing the relevant literature on the following topics:

- Type 1 diabetes
- Adolescents with Type 1 diabetes
- Self-care behaviors of adolescents with Type 1 diabetes
- Quality of life and adolescents with Type 1 diabetes:
 - Quality of life
 - Effect of diabetes on quality of life of adolescents with Type 1 diabetes
- Factors influencing quality of life of adolescents with Type 1 diabetes

Type 1 Diabetes

Type 1 diabetes is formerly known as insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes mellitus (Sacks et al., 2002: 752). It is the most common metabolic disorder of childhood (Sullivan-Bolyai et al., 2003: 21). Peak incidence occurs during puberty, around ten to 12 years of age in girls and 12 to 14 years of age in boys (Velasco-Whetsell et al., 2000: 461). Type 1 diabetes is caused by autoimmune destruction of the beta cells of the pancreas, leading to absolute insulin deficiency (Orr, 2002: 250). Insulin functions are to allow glucose to pass into the cell, to decrease the physiologic production of glucose, particularly in the liver, and to turn off ketone production (Chase & Eisenbarth, 2003: 979). Thus, when there is lack of insulin, glucose cannot be used in the cells for energy, and hyperglycemia results. The extraordinary concentration of glucose in blood promotes an osmotic diuresis, so large amounts of urine are produced. This osmotic diuresis is responsible

for the symptom of polyuria, and as the body struggles to maintain homeostasis, polydipsia ensues (Boland & Grey, 2000: 427). If glucose is not available as a source of energy, then alternative sources must be used. The body relies upon lipolysis as well as proteolysis. When this occurs, polyphagia becomes prominent as the body tries to avoid starvation. If these symptoms go uncorrected, the hyperglycemia and ketonemia secondary to increased lipolysis will progress to severe levels, and diabetic ketoacidosis will occur (Boland & Grey, 2000: 427). Diabetic ketoacidosis may lead to anorexia, nausea/vomiting (presence of ketone), sweet-smelling breath, deep respiration (Kussmaul), air hunger (compensatory for metabolic acidosis), and, if left untreated, coma and death (Velasco-Whetsell et al., 2000: 461). Therefore, replacement insulin injection therapy is required to sustain life and maintain diabetes control (Kyngas, 2000: 260).

The diagnosis of diabetes is easily established. Any children and adolescents with the classic symptoms including polyuria, polydipsia, polyphagia, and nocturia should have their levels of blood and urinary glucose and urine ketone levels determined. If the random blood glucose level is more than 200mg/dl and symptoms of diabetes are present, the diagnosis is established. Alternatively, if fasting blood glucose is equal to or greater than 126 mg/dl or the two-hour plasma glucose level is equal to or greater than 200 mg/dl on a glucose tolerance test, then the diagnosis is established (ADA, 1999: S1-S114 cited by Boland & Grey, 2000: 427).

Onset of Type 1 diabetes is most often at puberty, a time of major developmental transition (Cruickshanks et al., 1985 cited by Dashiff & Bartolucci, 2002: 96). In this period, there are developmental factors specific to the adolescents that may influence compliance with diabetes management regimens and metabolic control often worsens during this time. The deteriorating metabolic control in adolescence may be a consequence of inadequate insulin dose increments in response to accelerating growth and body weight, hormonal changes associated with puberty, psychological and social difficulties, missed insulin injections, and inappropriate eating behaviors (ISPAD Consensus Guidelines, 2000: 89).

Insulin is available in several different forms that affect the duration of action. The most common insulin regimens are combinations of regular insulin with NPH (Glasgow, 1992: 325). There are two insulin treatment regimens used to treat Type 1

diabetes in children and adolescents including conventional and intensive insulin therapy. Conventional therapy comprises one or two insulin injections per day (Grey & Boland, 2000: 427), whereas intensive therapy comprises three or more insulin injections per day, monitoring of blood glucose levels four or more times per day, careful attention to dietary intake, and at least monthly clinic visits for medical supervision and psychological support, as well as frequent telephone contacts for treatment reviews and adjustments (Chase & Eisenbarth, 2003: 981). To achieve good metabolic control and reduce the incidence and progression of microvascular and macrovascular complications, the Diabetes Control and Complications Trial (DCCT) has recommended that all adolescents with Type 1 diabetes over the age of 13 receive intensive insulin therapy (Grey et al., 2001: 377). However, intensive regimens may reduce quality of life through highly demanding self-care regimens and increased incidences of hypoglycemia (Rubin, 2000: 24). Therefore, effective treatment strategies must enable patients to achieve good metabolic control (The DCCT Research Group, 1993: 977-986 cited by Bott et al., 1998: 757), while at the same time they should interfere as little as possible with an independent and flexible lifestyle (Bradley & Gamsu, 1994: 510-516 cited by Bott, et al., 1998: 757).

When adolescents with Type 1 diabetes are unable to achieve good metabolic control, two potentially fatal acute complications and chronic complications can result. Hypoglycemia is one of the acute complications resulting from too much insulin, too little food, or too much exercise causing dangerously low blood glucose levels with the possibility of seizures and coma. Hypoglycemia can be divided into three categories: 1) asymptomatic hypoglycemia, 2) mild to moderate symptomatic hypoglycemia, and 3) severe hypoglycemia. Symptoms of mild to moderate hypoglycemia include tremors, sweating, light-headedness, irritability, confusion, and drowsiness. This degree of hypoglycemia requires prompt ingestion of carbohydrates, and it may require medical assistance. Severe hypoglycemia, which is rare, may lead to unconsciousness and convulsions and can be life-threatening if not treated promptly (ADA, 2002: S126). In general, diabetic adolescents should be able to recognize and perform self-management of mild to moderate symptomatic hypoglycemia. However, severe hypoglycemia is temporarily disabling and, therefore, requires the assistance of another person. Detection of asymptomatic hypoglycemia

requires measurement of the plasma/blood glucose concentration (The DCCT Research Group, 1991: 450-459).

On the other hand, hyperglycemia (high blood glucose) occurs when the body gets too little insulin, too much food, or too little exercise. It may also be caused by stress or an illness such as a common cold. The most common symptoms of hyperglycemia are thirst, frequent urination, and blurry vision. If left untreated over a period of days, hyperglycemia can cause a serious condition called diabetic ketoacidosis (DKA), which is characterized by nausea, vomiting, and a high level of ketones in the blood and urine. DKA can be life-threatening and thus requires immediate medical attention (ADA, 2002: S126).

The other acute complication is caused by a lack of insulin or severe stressful events such as illness/trauma and results in dangerously high blood glucose levels, diabetic ketoacidosis (DKA). DKA is the result of series of metabolic mechanisms in the body attempting to regulate the hyperglycemia that if unchecked will lead to dehydration, electrolyte imbalance, and coma (Leonard et al., 2002: 28-29). Ketoacidosis can develop at any time of Type 1 diabetes, and almost all further episodes of ketoacidosis are due to major deviations in therapy, such as missed insulin injections (Golden et al., 1985: 107-195; Schade et al., 1985: 8-12; White et al., 1984: 749 cited by Glasgow, 1992: 321). Even one episode of ketoacidosis in a patient with established diabetes should be taken as an indication of either major knowledge deficits or a significant deviation from prescribed therapy (Glasgow, 1992: 321). Adolescents with Type 1 diabetes must be educated to check urine ketones during any illness (including vomiting even once) or any time a fasting blood glucose level is above 250 mg/dl, or randomly measured glucose level is above 300 mg/dl. If hyperglycemia with moderate or large ketonuria is detected, the physician must be called for consultation and 10-20% of total daily insulin dosage must be given subcutaneously as extra regular insulin every two to three hours until the urine ketone is small or negative. This prevents ketonuria from progressing to ketoacidosis and allows most patients to receive treatment at home by telephone management. Juice and other fluids are encouraged, and suppositories of promethazine to prevent vomiting may be indicated. However, if deep breathing (Kussmaul respirations) or

excessive weakness occurs, the patients should be evaluated promptly by a physician (Chase & Eisenbarth, 2003: 983).

Besides, chronic hyperglycemia leads to chronic complications such as microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular (coronary artery disease and stroke) complications (Orr, 2002: 250). These chronic complications usually appear following ten to 15 years of established diabetes (Betschart, 1997: 201), and they are the major cause of mortality, reduced life expectancy (DoH, 2001b, cited by King, 2003), and decreased quality of life (Delamater et al., 1999: 700). Therefore, Type 1 diabetes is considered a major health problem worldwide.

Adolescents with Type 1 Diabetes

Adolescents with Type 1 diabetes face a double challenge to adapt to a lifestyle that requires complex daily self-management of dietary practices, exercise behaviors, monitoring of blood glucose level, and insulin adjustment to maintain good metabolic control in addition to developing normal development tasks including autonomy and self-identity. Rapid biological, physical, cognitive, emotional, and social changes occurring during this time period along with learning to manage a chronic life-long illness place adolescents at risk for poor metabolic control, life adjustment difficulties (Wolfsdorf, 1999 cited by Faulker, 2003: 362), and may also interfere with the adolescents' opportunities for achievement of the normal developmental tasks (Sullivan-Bolyai et al., 2003: 22). When development is disrupted by chronic illness, dependence and feeling of being different can interfere with the development of positive self-esteem (Overbaugh & Savin, 1992 cited by Cavusoglu, 2001: 355). As adolescents struggle to cope with all these changes, they often experience ambivalence and mood swing, and may engage in experimentation and risk-taking behaviors (Faro, 1999: 247). Coping with both the physical demands of management as well as the emotional and social demands of adjustment can be a formidable task (Grey et al., 1998: 902). The continual adaptation and ability to cope with these physically and emotionally stressful demands is imperative (Davidson, Boland, & Grey, 1997: 65). Therefore, Type 1 diabetes creates increased self-care demands, and adolescents with Type 1 diabetes are expected to assume increasing

responsibility for management of their diabetes to maintain good metabolic control and well-being. The therapeutic self-care demands of adolescents with Type 1 diabetes are as follows:

1.1 Maintenance of a sufficient intake of food and energy

The nutritional needs of adolescents with diabetes do not differ from those of adolescents who do not have diabetes, nor do they require special foods or different amounts of vitamins or minerals. The total intake of energy (calories) and nutrients must balance the daily expenditure of energy and satisfy the requirements for normal growth. The dietary prescription is based on the nutritional assessment and on one of the methods of estimating energy and protein allowances. A method commonly used to estimate energy requirements is based on age and can be used as a crude approximation for adolescence child up to 12 years old: basal needs for all adolescence child equal 1000 kilocalories (Kcal); for boys add to the basal needs 125 kcal x age in years, and girls add 100 kcal x age in years. For very active adolescence child, add up to 20% more kcal. Moreover, the American Diabetes Association (ADA) has recently recommended that carbohydrates provide 50 to 60% of total calories and that protein and fat provide no more than 15 to 20% and 30% of total calories, respectively. Because the nutritional requirements change with growth and physical development, the diet prescription has to be reviewed and adjusted, if necessary, at least every six months, to ensure maintenance of a normal rate of physical growth and maturation (Wolfsdorf et al., 1994: 535).

1.2 Maintenance of a sufficient sleep and rest

In general people require six to eight hours of sleep. Sufficient rest will help them recuperate from illness and improve health (Lee, 1997: 617 cited by Chokephichit, 2003: 25). Adolescents with Type 1 diabetes who are in good control should have no sleeping problems. However, those who are hyperglycemic overnight will have difficulty sleeping because of the recurrent need to urinate (Boland & Grey, 2000: 437). Moreover, nighttime hypoglycemia (nocturnal hypoglycemia) should be suspected if pre-breakfast blood glucose is low, if adolescents are in confusional states, if nightmares or seizures occur during the night, or if they experience impaired thinking, lethargy, altered mood, or headaches in waking (ISPAD Consensus Guidelines, 2000: 79). Such problems can be managed by improving metabolic

control, and prevention is the key. This is because nocturnal hypoglycemia is to be avoided as much as possible by careful adjustment of diet and insulin (Boland & Grey, 2000: 437), maintaining bedtime blood glucose levels in target range, ensuring that a bedtime snack is eaten, and blood glucose measurement is done towards midnight (ISPAD Consensus Guidelines, 2000: 79-80).

1.3 Practicing exercise appropriate with clinical condition

The benefits that persons without diabetes gain from an exercise are improved fitness and psychological state, decreased adipose tissue stores, and weight control. For persons with diabetes, exercise has additional benefits such as increased insulin sensitivity which results in a reduction in insulin dosage, and a reduction of risk factors for atherosclerosis (Franz, 1996: 174 cited by Sangeam, 2000: 14-15). Moreover, exercise helps adolescents with diabetes get better self-image (Landt et al., 1985: 461). However, caution must be advised to patient with developing chronic complications from diabetes to undertake an exercise (Horton, 1988: 201 cited by Sangeam, 2000: 14-15). Hypoglycemia is the most frequent complication of exercise in people with type 1 diabetes. The following are strategies to assist adolescents with type 1 diabetes to exercise safely (Franz, 1996: 181-182 cited by Sangeam, 2000: 14-15):

1. Blood glucose testing before and after exercise is essential.
2. Food intake may need to be increased to accommodate exercise. In general, 15 grams of carbohydrate should be taken before or after one hour of moderate activity.
3. Strenuous exercise over an extended time requires a decrease in insulin doses.
4. Peak time of injected insulin and possible decrease in blood glucose levels with exercise at that time should be considered.
5. Injected sites are not a major concern unless the injection is given in a part of the body that will be exercising immediately.
6. Patients should carry identification and a source of readily available carbohydrate.

1.4 The maintenance of a balance solitude and social interaction

Adolescents with diabetes should have the same social rights as their non-diabetic peers, and no stigma nor discrimination should be attached to diabetic persons (ISPAD Consensus Guidelines, 2000: 79). Because adolescents spend a considerable amount of time with peer at school, the strong peer relationships are fundamental for the development of social skills, and a healthy self-concept, future emotional adjustment (Auria et al., 2000: 175), and they can also provide positive role models and group activities during adolescence (NDEP, 2004). Increasing severity of diabetes can lead to frequent and lengthy school absences (Orr et al., 1983: 170), higher rate of hospitalizations, and emergency visits (Tkacs, 2002: 37). These illness-related events can separate diabetic adolescents from unaffected peer, thus interrupting their ability to build successful peer relationships (Auria et al., 2000: 176). Besides, social isolation is frequent in this group (Orr et al., 1983: 170; Lloyd et al., 1993: 481-485 cited by Jacobson et al., 1997: 811). Adolescents with Type 1 diabetes need to live with diabetes in their normalized life, and they need acceptance from peers or close persons, as well as social support. Because of the social stigma and fear associated with contagious aspect of the disease, others, even family members, may want to avoid social and physical contact (Flaskerud, 1995: 308 cited by Wanthong, 2002: 27). Therefore, adolescents with Type 1 diabetes need support from families, peer groups, school personnel, and healthcare providers.

1.5 The prevention of hazards to human functioning and human well-being

According to the Diabetes Control and Complications Trial (DCCT) and the U.K. Prospective Diabetes Study (UKPDS), the goals of treatment of diabetes should be to achieve glycemic control as close to normal and as possible. In adolescents with Type 1 diabetes, strict diabetes control will optimize growth and normal pubertal development, as well as decrease the risks of microvascular complications (Boland et al., 2001: 1858). On the other hand, poor metabolic control may decrease immunity, making them prone to a variety of infections. During intercurrent illnesses, adolescents with diabetes may have dehydration, hypoglycemia, and ketoacidosis. Thus, the diabetic care team should provide clear management and guidance for adolescents with diabetes to avoid the complications of dehydration, hypoglycemia, and ketoacidosis (ISPAD Consensus Guidelines, 2000: 74). To achieve metabolic control, all adolescents with Type 1 diabetes require a complex balance among insulin,

food, and exercise (Glasgow, 1992: 323; ADA, 2002: S126). Self-monitoring of blood glucose levels and urine ketone provides ongoing feedback on the effectiveness of their efforts to achieve optimal metabolic control (Grossman et al., 1987: 324). Moreover, successful management of diabetes requires stable routines regarding nutrition, exercise, insulin injections, and careful daily monitoring. These routines are challenging to maintain in today's family and school environments (Dashiff & Bartolucci, 2002: 96).

1.6 Promotion of normal growth and development in a transitional period into adolescence

Adolescents with Type 1 diabetes face a double challenge. They confront all the usual social, emotional, and physical issues of adolescence. At the same time, they must develop skills to maintain good blood glucose control for a lifetime. The diabetes management and behavior tasks such as frequent glucose monitoring and insulin injections may also interfere with the adolescents' opportunities for normal development experiences (Sullivan-Bolyai et al., 2003: 22). The daily demands of diabetes have an impact on personal and public lives of adolescents, and an interaction with vital developmental tasks such as independence, body image, identity, sexuality, responsibility, and self-esteem (Daneman & Frank, 1996: 694 cited by Sangeam, 2000: 2). Moreover, impaired growth and delayed pubertal development may occur in adolescents with poor metabolic control (ISPAD Consensus Guideline, 2000: 102).

1.7 To seek knowledge about Type 1 diabetes and secure continuously appropriate medical treatment

All adolescents with Type 1 diabetes should accept their illness and be concerned with improving symptoms and maintaining their health (Petcharatna, 2002: 31). Living with Type 1 diabetes, adolescents and their family members should be seeking information and learn about Type 1 diabetes for proper self-care management and handling of the problems of diabetes care at home (Chase & Eisenbarth, 2003: 979). An effective self-management requires frequent and high levels of educational input and continuing support because education is the keystone of diabetes care and management. However, diabetes education may not match those of the adolescents and family. Thus, diabetes education should be based on a thorough assessment of the

adolescents' attitudes, beliefs, learning style, ability and readiness to learn, existing knowledge, and goals. In addition, diabetes education needs to be adaptable and personalized so that it is appropriate to each individual's age, stage of diabetes, maturity, and lifestyle. It should also be culturally sensitive and at a pace to suit individual needs (ISPAD Consensus Guidelines, 2000: 24). However, knowledge about diabetes does not necessarily correlate with good metabolic control. Successful education not only instills knowledge, it must also empower and motivate the adolescents with Type 1 diabetes to use knowledge and practical skill in problem-solving and self-care management (ISPAD Consensus Guidelines, 2000: 27).

1.8 Being aware of and attending to the effects and results of pathologic condition

Adolescents with Type 1 diabetes with poor control can have life-threatening implications for the acute complications of hypoglycemia and hyperglycemia with ketoacidosis, and this has been shown to increase the risks of microvascular and neurological complications in later life (Lowes & Lyne, 2000: 46). Hypoglycemia (low blood glucose) is the most common acute complication for adolescents with Type 1 diabetes. It occurs when the body gets too much insulin, too little food, a delayed meal, or more than the usual amount of exercise.

1.9 Being aware of attending to or regulating the discomfort and deleterious effect of medical care

Achieving optimal metabolic control can reduce the development and progression of microvascular and neuropathic complications by 50% in those with Type 1 diabetes (ADA, 1993: 977-986; UK Prospective Diabetes Study Group, 1998: 837-851 cited by Taylor et al., 2003: 1058). About 30-40% of persons with Type 1 diabetes eventually develop renal failure or loss of vision. Factors that greatly reduce this likelihood are longitudinal HbA_{1c} levels in good range of < 7%, maintenance of blood pressure below the 90th percentile for age, and abstinence from smoking or chewing tobacco. Annual retinal examinations and urine microalbumin measurements are important for children aged ten years or older who have had diabetes for three years or longer. Data now show that the use of angiotensin-converting enzyme inhibitors may reverse or delay kidney damage when it is detected in the microalbuminuria stage (20-300 µg/min). Similarly, laser treatment to coagulate

proliferating capillaries prevents bleeding and leakage of blood into the vitreous fluid or behind the retina. This treatment helps prevent retinal detachment and preserve useful vision for many people with proliferative diabetic retinopathy (Chase & Eisenbarth, 2003: 985). Therefore, to achieve the diabetes treatment goals by all current guidelines, diabetic adolescents are required to self-monitor blood glucose, take frequent insulin injections, and exercise, in addition to attending to diet, foot and oral care, and obtaining yearly monitoring of visual and renal status (Taylor et al., 2003: 1058).

1.10 To carry out medically prescribed treatment as effectively, correctly, and continuously as possible

All adolescents with Type 1 diabetes are dependent on insulin for survival and maintenance of diabetes control throughout their life. They cannot stop insulin injection although they are sick (ISPAD Consensus Guidelines, 2000: 74). Daily insulin dosage varies greatly between individuals and changes over time. Healthcare professionals have the responsibility to advise adolescents and their parents on adjusting insulin therapy safely and effectively. This training requires regular reviews and reinforcements (ISPAD Consensus Guidelines, 2000: 50-51).

Insulin is available in several different forms that affect the duration of action; the most common insulin regimens are combinations of regular insulin with NPH, usually given twice a day (Glasgow, 1992: 325). As insulin injection is given subcutaneously, adolescents need to learn proper injection techniques so that insulin injections are as consistent as possible. Inadvertent intramuscular injection can significantly hasten insulin absorption and shorten the duration of action. Intramuscular injection may occur when the subcutaneous tissue is not pinched. In practice, adolescents are recommended against self-injecting their own arm without help from others to pinch their subcutaneous tissue. Likewise, insertion of the needle should not be perpendicular to the thin young children whose available pinched subcutaneous tissue is scanty. Failure to release the pinch prior to withdrawing the needle may result in pressure forcing the insulin out of the injection site. Insulin absorption also varies by injection site. Furthermore, frequent injection in the same area may result in hypertrophy, which can impair insulin absorption. Insulin absorption also varies by anatomic region, with decreasing rapidity of absorption in

the abdomen, arms, thighs, and buttocks, in that order. A rotation pattern in which all injections at any one time of the day are given into areas with similar insulin absorption may improve absorption regularity. Besides, insulin absorption may be increased by exercise. Therefore, avoidance of areas of exercising muscles may be indicated for some patients (e.g., avoiding the thighs when running). Giving insulin 30-50 minutes prior to meals can significantly reduce postprandial hyperglycemia (Glasgow, 1992: 324-325).

Moreover, loss of insulin potency may contribute to poor control. Adolescents and families should be warned that excessive heat or freezing may damage insulin. A single bottle of insulin may be sufficient to provide months of insulin therapy for a very young child. The expiration date is intended to provide a safe limiting date for insulin that is not being used regularly. In practice, it is recommended that a vial of insulin be used for six weeks to two months (Glasgow, 1992: 325). In addition, insulin type and species, injection technique, insulin antibodies, site of injection, and individual patient response differences can all affect the onset, degree, and duration of insulin activity. Besides, the species and dosage of insulin used should be consistent, and the patients' injection technique should be reviewed periodically with the diabetes-care team.

Thus, the effective use of insulin to obtain the best metabolic control requires an understanding of duration of action of the various types of insulin and the relationship of blood glucose levels to exercise, food intake, intercurrent illness, certain medications, and stress; self monitoring of blood glucose; and learning to adjust insulin dosage to achieve the individualized target goals established between the patient, family, and the diabetes-care team (ADA, 2004: S109).

1.11 Learning to live with the effects of the pathology of the disease or existing conditions peacefully

Type 1 diabetes is a chronic life-long and incurable disease. Having Type 1 diabetes, adolescents face many challenges, including change in lifestyle, such as regimented scheduling of everyday life, readjustment of roles in the family, and potential activity alterations (Amer, 1999: 627). Most adolescents with Type 1 diabetes frequently feel that their lives are negatively affected due to diabetes, partly because of the necessity to integrate and coordinate the various components of the

treatment regimen into normal activities (Beaser et al., 1996: 985). Therefore, both adolescence child and their families need the guidance and counseling from healthcare professionals about ways to normalize their lives as much as possible. Furthermore, they must realize that their lives will never be the same as before having Type 1 diabetes and learn to live with diabetes for the rest of their life. Throughout the course of diabetes, diabetic adolescents and families rely on healthcare professionals to provide information about health promotion, diabetes management, assistance with the process of adaptation, and recruitment of other psychological or social resources (Amer, 1999: 627).

1.12 Seeking and securing appropriate medical assistance

Living with diabetes, adolescents learn to manage their own illness. Although most adolescents take more responsibility for their self-care tasks over time, they still need and benefit from assistance and support from parents, especially with blood glucose testing, dietary management, and insulin administrating (Frey, Ellis, Naar-King, & Greger, 2004: 648). Adolescents of all ages with Type 1 diabetes need assistance from other persons such as parents, family members, friends, teachers, or school nurses to perform a blood glucose test when they face with crises such as hypoglycemia, diabetic ketoacidosis, or intercurrent illness. Thus, adolescents with diabetes should not hide their diabetes and carry an ID card because when they have an hypoglycemic event, they require assistance to check blood glucose and a reminder to eat or drink during hypoglycemia, and they should not be left unsupervised until such treatment has taken place and blood glucose value has returned to the normal range (ADA, 2002: S125). In addition, parents, healthcare teams, and school personnel should work together to provide school systems with the information necessary to allow adolescents with diabetes to participate fully and safely in the school experience. To facilitate the appropriate care of the students with diabetes, school must have an understanding of diabetes and must be trained in its management and the treatment of diabetes emergencies (ADA, 2002: S125).

In addition, seeking information resources and assistance from facilitated 24-hour telephone support provided by healthcare professionals for adolescents with diabetes and their families when they have any problems about diabetes is necessary. This assists not only general diabetic management but also provides invaluable

support during illness and other crises. In so doing, admissions to hospital may be prevented (ISPAD Consensus Guidelines, 2000: 52).

Moreover, seeking social support from close friends may be important because adolescents spend most of their daytime hours in school or leisure setting with friends (La Greca & Prinstein, 1999 cited by Bearman & La Greca, 2002: 417). Furthermore, close friends represent a significant source of emotional support (Hartup, 1996 cited by Bearman & La Greca, 2002: 417) and may facilitate adolescents' adjustment to chronic illness or their ability to cope with a difficult medical treatment (Burroughs et al., 1997 cited by Bearman & La Greca, 2002: 417-418).

1.13 Appropriate coping with stress from illness and treatment

Adolescents with Type 1 diabetes face increased stress when dealing with major lifestyle changes and the possibility of experiencing debilitating and life-threatening complications if they cannot achieve optimal metabolic control. They must cope with demands of self-management including both the physical demands of management as well as the emotional and social demands and adjustment (Hanson et al., 1989: 644-651 cited by Grey et al., 1998: 902). Therefore, management of stress is important on a short-term basis because stress hormones increase blood glucose levels. Moreover, chronic emotional upsets may lead to missed injections or other compliance problems. When this happens, counseling for the adolescence children and family becomes an important part of diabetes management (Chase & Eisenbarth, 2003: 982). Therefore, adolescents with Type 1 diabetes should be regularly screened for psychological problems with open-ended questioning about stress, social support, beliefs about their disease, and behavior that could impair metabolic control. Also, interventions including ongoing psychological support and reinforcement, coping skills training, and family behavior therapy should be offered as appropriate (Canadian Diabetes Association, 2003: S51).

In summary, adolescence is a period of transition from dependence to independence, during which time adolescents with Type 1 diabetes face double challenges, the primary of which is developing responsibility in normative developmental tasks. At the same time, they are expected to assume increasing responsibility to manage their diabetes tasks in order to maintain their good metabolic control and well-being.

Self-Care Behaviors of Adolescents with Type 1 Diabetes

Today many individuals and families with chronic illness have a higher level of interest in their health and a greater responsibility for their own care. Healthcare professionals also have incorporated the self-care philosophy into their practice. The concept of self-care has a wide range of meanings given the various perspectives as follows:

Levin (1976: 206 cited by Hanucharunkul, 1988: 25) defines self-care as a process whereby lay people function on their own behalf in health promotion and prevention and in disease detection and treatment at the level of the primary healthcare resource in the healthcare system. Self-care is also a decision-making process that involves self-observation, symptom perception, labeling, judgment of symptom severity, and then choice and assessment of treatment and options.

Orem (1995: 104) defines self-care as the activities that individuals initiate and perform on their own behalf in maintaining life, health, and well-being. Self-care comprises purposeful and deliberate action that is learned by the person and directed toward a goal. An individual's knowledge, motivation, and skill influence the ability to carry out self-care. Also, the ability of a person to engage in self-care activity occurs through a developmental process that includes interactions of physical, psychological, social, cognitive, and affective characteristics (Orem, 1991). Self-care activities of adults have been more widely described than those of adolescents. However, adolescents are capable of performing and reporting self-care (Synder, 1989 cited by McCaleb & Cull, 2000: 31). This age group is able to consider lifestyle choices and establish self-care behaviors that can influence health status in adulthood (Synder, 1989 cited by McCaleb & Cull., 2000: 30).

As adolescence children grow, foundational capabilities and dispositions for engagement in the form of deliberate action self-care develop. "They learn what to do and not to do in gradually widening areas of human living and develop behavioral repertoires for taking action when various combinations and circumstances prevail in themselves or in their environment" (Orem, 1995: 225). Adolescents with Type 1 diabetes usually use time and effort for self-care throughout their life in order to control the disease. However, they should begin to learn good health practice at early age and be able to actively and responsibly participate in their healthcare. Self-care

behaviors are important and necessary to maintain life, health, and well-being, or quality of life (Hanucharunkul, 1988: 34). Thus, the researcher selected Orem's Self Care Model (Orem, 1995) as the theoretical framework for this study.

Type 1 diabetes is a chronic life-long condition whose daily management presents numerous challenges to achieve satisfactory metabolic control: multiple daily insulin injections, frequent blood glucose monitoring, frequent contacts with the medical professionals, and careful regulation of exercise and meal schedules. The goals of diabetes care are to maintain blood glucose levels near-normal and enable individuals to prevent acute and long-term complications as well as ensure good quality of life. Specific goals of diabetic adolescents are maintaining normal growth and maturation and becoming self-reliant in diabetes self-care including both social and psychological maturity and well-being (Koivisto et al., 1995 cited by Tulokas, 2001). Management of Type 1 diabetes is complex, challenging, and mainly behavioral, and it can be a problem for adolescents. To achieve such goals, adolescents with Type 1 diabetes need to perform five central diabetes self-care tasks to meet their therapeutic self-care demands including administering insulin, monitoring blood glucose and urine ketone levels, regulating diet, exercising appropriately, and managing stressors (Chase & Eisenbarth, 2003: 979). Moreover, they need to perform self-care behaviors following the treatment regimen (Beaser et al., 1996: 984) within the context of a satisfying lifestyle that requires a great effort and commitment on the part of the adolescents and their family. Successful management of diabetes requires stable routines regarding nutrition, exercise, insulin injections, and self-monitoring of blood glucose in the family and school environments (Dashiff & Bartolucci, 2002: 96). Furthermore, persons with diabetes need to not only integrate treatment regimen into daily lives but also cope with stressful events in everyday life. Failure to achieve metabolic control can lead to acute and chronic complications and result in physical and psychological distress, reduced life expectancy, and added financial burden in adolescents' every life that affect their quality of life.

Adolescence is a period of transition from dependence to independence, during which individuals begin to adopt a multitude of new social and emotional roles, learn to cope (Kyngas, 2000: 261), and learn to take responsibility for and manage

their own diabetes (Ingersoll, Orr, Herrold, & Golden, 1986 cited by Hampson et al., 2000: 1416). Adolescents can experience persistent poor metabolic control in this time. Many factors may contribute to this problem; however, most experts agree that persistent poor metabolic control is due to inadequate diabetes management secondary to psychological and/or social factors (Mayou, 1991 cited by Frey, Ellis, Naar-King, & Greger, 2004: 648). In some rare cases, this is due to pathophysiological problems such as insulin resistance and direct effect of stress on elevation of blood glucose. However, as Fisher et al. (1982 cited by Fosbury, Bosley, Ryle, Sonksen, & Judd, 1997: 959) have also pointed out, lack of adherence to treatment in diabetes is common, and thus the most frequent cause of poor control is poor self-care behaviors in relation to varying aspects of diabetes management.

The measurement of compliance can be done with many methods, but direct methods such as blood and urine analyses are not relevant because they measure short-term outcomes rather than the process of compliance. Besides, serum glycosylated hemoglobin (HbA1c) values that are indicative of long-term metabolic control are commonly used to assess the outcome of compliance. They reflect the diabetes control over the previous six to eight weeks. Nevertheless, this view has been challenged by the findings of Daviss et al. (1995 cited by Kyngas, 2000: 261), which have indicated that the assessment of compliance shown by young people with diabetes and that shown by the HbA1c values provide similar information. Besides, a few studies have suggested that HbA1c may not be a reliable criterion of compliance (Hanestad & Albrektsen, 1991 cited by Hyngas 2000: 260-261). Therefore, indirect methods such as self-report and interview are generally used because they have the advantage of showing the individuals' own assessment of their compliance, which could also serve as a good starting point for discussion of care (Spliker, 1991 cited by Kyngas, 2000: 260).

Based on the review of literature, there is no relevant instrument to measure self-care behaviors specific to adolescents with Type 1 diabetes in Thailand. Therefore, the researcher developed an instrument to measure self-care behaviors of adolescents with Type 1 diabetes in the present study based on Orem's conceptualization of self-care (1995) and AADE 7 core measures of outcomes performance (Mulcahy et al., 2003). In addition to these, some modified items from

the Summary Diabetes Self-care Activities Measures (SDSCA) (Keeratiyutawong, 2004) were included. See Chapter III for more information regarding the research instrument.

The reasons for poor self-care are complex and many factors are involved. However, the standard approach to improve self-care in clinic is increasing the patients' knowledge. Numerous research has been conducted with an aim to study the relationship between knowledge and compliance. According to Shillitoe (1988 cited by Fosbury et al., 1997: 959), there is little evidence that patients in better metabolic control actually know more than those with poor control. Graber et al. (1997 cited by Fosbury et al., 1997: 959) have also stated that some education programs do improve diabetes control, but relapse rates have been shown to be high when the programs cease. Knowledge about diabetes and treatment is essential for the patients' compliance, but knowledge alone is not enough to promote the behavioral changes required as part of management of the disease (Kyngas, 2000: 261). Diabetes education programs tend to concentrate on the rational processes that inform decision making, but everyday decisions and behaviors are to the large extent determined by unconscious and emotional influence. This is likely to be true of behaviors that make up self-care in both health and illness. Psychological or emotional difficulties affect diabetes management by affecting adolescents' ability or willingness to perform self-care (Fosbury et al., 1997: 959).

The cornerstone of diabetes care is self-management (Ruggiero et al., 1997: 568-576 cited by Schilling, Grey, & Knafl, 2002: 88). The management of diabetes in young persons calls for their compliance with health regimens, which is in itself a complicated process and one very difficult to define. Many different definitions have been proposed, but none of them is generally accepted (LaGreca, 1990; Henson, 1997; Kyngas, Duffy, & Kroll, 2000 cited by Kyngas, 2000: 260). For example, Goodal & Halford (1991 cited by Ruggiero et al., 1997) define self-management as a set of skilled behaviors individuals engage in to manage their own illness. According to Wysocki & Greco (1997 cited by Schilling, et al., 2002: 96), self-management is a responsibility undertaken by adolescents and their families. However, most definitions contain elements relating to patients' self-care responsibilities, their role in the treatment process, and their collaboration with healthcare providers (Kyngas, 2000:

260). Self-management can be written in many terminologies and used as synonyms such as self-care, compliance with self-care, self-care management (Schilling et al., 2002: 88), adherence (LaGreca, 1990; Henson, 1997 cited by Kyngas, 2000: 260), compliance, and self-care behavior (Jacobson et al., 1987: 810). Self-care behavior is the term of self-management used in the present study.

Compliance to self-care in diabetes has been studied across a range of disciplines, including nursing, medicine, and psychology. The existing research covers demographic factors, self-care behaviors, patient characteristics, social support from family and friends, and effects of education programs on compliance. The results show that psychosocial factors (e.g., values, attitudes) and motivation have greater influence on compliance than metabolic and demographic factors (Kyngas, Hentinen, Koivukangas, & Ohinmaa, 1996 cited by Kyngas, 2000: 261). It appears that psychosocial factors (e.g., positive personal meaning of illness and treatment, attitude, therapeutic motivation, emotional well-being, etc.) exert the greatest influence on adolescents' compliance, but family, peer, and healthcare provider support is essential for promotion of compliance (Kyngas, Hentinen, & Barlow, 1998 cited by Kyngas, 2000:261). Family characteristics and behaviors related to poor metabolic control include frequent arguments about diabetes, as well as dysfunctional family interaction patterns such as conflicts. Adolescents from a single-parent family are also at higher risks for poor metabolic control than those with two parents (Frey et al., 2004: 648). Parents of adolescents with poor metabolic control have reported providing less supervision and engaging in fewer supportive behaviors for diabetes management than parents of adolescents with better metabolic control (Liss et al., 1998 cited by Frey et al., 2004: 648). A major area where parental support may be lacking is empathy for the adolescents with regard to the challenges of completing the many activities and tasks for managing diabetes. Parents of adolescents with poor control have also reported that their teens do not take enough responsibility for diabetes care and attributed this to laziness, a preference for engaging in more enjoyable activities, and/or denial of the seriousness of their medical condition (LaGreca, 1998 cited by Frey et al., 2004: 648). Although most adolescents take more responsibility for self-care tasks over time, they still need and benefit from

assistance and support from parents, especially with blood glucose testing, dietary management, and insulin administration.

Insulin omission is the most common diabetes management behavior associated with poor metabolic control. Reasons for insulin omission include giving adolescents the responsibility for insulin administration before they are ready, the absence of supportive adults, just forgetting, and/or not having supplies available (Weissberg et al., 1995 cited by Frey et al., 2004: 648). Grey, Marrero, Godfrey, Orr, & Golden (1988 cited by Frey et al., 2004: 648) reported that 66% of their adolescents with chronic poor metabolic control admitted to omission of insulin. When adolescents cannot achieve this minimal level of diabetes management, they cannot use the newer diabetes treatments that could improve metabolic control, such as intensive insulin therapy, use of insulin pump, and newer types of insulin, because of the high level of management required (Plotnick, Clark, Brancati, & Erlinger, 2003 cited by Frey et al., 2004: 648). Additional consequences for adolescents with poor control are poor school attendance, depression, social isolation, and psychiatric disorder (Liss et al., 1998 cited by Frey et al., 2004: 648).

Behavioral interventions are designed to improve levels of self-care by applying psychological principles to assist adolescents with diabetes in making desired changes to their behavioral patterns and lifestyle. These interventions are wide ranging. They may address knowledge and skills, psychological factors (e.g., self-efficacy), and behaviors (e.g., eating and exercise pattern) (Hampson et al., 2000: 141).

In summary, Type 1 diabetes is a chronic life-long, debilitating disease affecting every organ systems. Management of Type 1 diabetes is complex, challenging, and mainly behavioral, and can become a particular problem for adolescents. To achieve good metabolic control, adolescents with Type 1 diabetes must perform complex self-care activities by balancing among diet, exercise, and insulin. They need to not only integrate treatment regimen into daily lives but also cope with stressful events in everyday life. Without good control, acute and long-term complications are more likely to develop. Self-care behaviors are a dynamic process and involve multidimensional aspects of management of one's own chronic disease.

Quality of Life and Adolescents with Type 1 Diabetes

Since 1948, the World Health Organization has defined health as being not only the absence of disease and infirmity but also the presence of physical, mental, and social well-being (WHO, 1952: 3-20). This implies the completeness, full functioning or efficiency of mind and social adjustment. To obtain a holistic picture, the effects of treatment on quality of life and the context of the disease should be assessed (Luk, 2004: 202). Therefore, quality of life has been increasingly recognized as an important factor in outcomes assessment of chronic diseases as diabetes.

In recent years, quality of life has been recognized as an important outcome of medical treatment and has become a core issue in diabetes care than the traditional outcomes of mortality and morbidity. Therefore, the effect of Type 1 diabetes on quality of life in children and adolescents are an increasing concern to healthcare professionals. One of the reasons behind the rapid development of quality of life measures in healthcare has been the growing recognition of the importance of understanding the impact of healthcare interventions on patients' lives rather than just on their bodies. This is particularly important for patients with chronic diseases who live without the expectation of cure and have chronic conditions that are likely to have an impact on their physical, psychological, and social well-being (Addington & Kalra, 2001: 1417 cited by Jangtrakoon, 2003: 15).

Definition of quality of life

Quality of life is very significant for human life not only in health but also in illness. Many experts have examined the context of quality of life and found that it is difficult to construct, define, and measure because cultural, ethical, religious and other personal value influence perceptions of the meaning and consequences of quality of life (Zhan, 1992: 975 cited by Wanthong, 2002: 20). Therefore, the concept of quality of life has been given different meanings, depending on the users. The term "quality of life" is defined differently by various experts as follows:

The World Health Organization (WHO) defines quality of life as individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It involves aspects of physical health, psychological state, levels of independence, social

relationships, environmental factors, and personal beliefs (WHOQOL Group, 1996: 354-356).

According to McDaniel & Bach (1994: 18-22), quality of life is the congruence or lack of congruence between actual life conditions and one's hopes and expectations.

Grant et al. (1990: 260-270) define quality of life as a personal statement of the positivity or negativity of attributes that characterize one's life.

Zhan (1992: 796) defines quality of life as the degree to which a person's life experiences are satisfactory.

For Murdaugh (1992: NS44), quality of life is the experience of living with a disease, or the individual's sense of well-being as he or she adjusts and readjusts to living with a chronic disease.

Hinds (1990: 285-291) defines quality of life as children's and adolescents' subjective and changeable sense of well-being that reflects how closely their desires and hopes match what is actually happening and their orientation toward the future, both their own and that of others.

According to Holmes and Dickerson (1987 cited by Farquhar, 1995: 505), quality of life is recognized to be a dynamic concept representing individual responses to the physical, mental, and social effect of illness. It influences the extent to which personal satisfaction can be achieved under difficult circumstances, and it allows favorable comparison with others according to selected criteria.

Ferrans & Powers (1985: 15-24) define quality of life as an individual's perceptions of well-being that stem from satisfaction with dimensions of life that are important to the individual.

Young & Longman (1983: 219-225) define quality of life as the degree of satisfaction with perceived present life circumstances.

Lewis (1982: 219-225) define quality of life as the degree to which one has self-esteem, a purpose in life, and minimal anxiety.

Abam (1973 cited by Farquhar, 1995: 503) defines quality of life as the degree of satisfaction or dissatisfaction felt by people with various aspects of their lives.

However, there are a variety of terms equated with quality of life (Dean, 1985: 99), such as life satisfaction (Brown et al., 1981: 1136; Laborde & Powers, 1980: 19; Ferran & Powers, 1985: 15), self-esteem (Ziller, 1974: 301), well-being (Fletcher & Bulpitt, 1985: 140; House et al., 1975: 57; Carstensen & Cone, 1983: 713), health status (Sugarbaker et al., 1982: 17; Bergner et al., 1976 57; Lerner, 1973: 6), and happiness (Shinn & Johnson, 1978: 475). Therefore, the terms quality of life, satisfaction, well-being, and health status are often used interchangeably (Snoek, 2000: 24). However, these terms do not equate totally to quality of life (Puavilai, 2000: 22).

In summary, the concept of quality of life has been defined differently, depending on the users. In the present study, quality of life is defined as perceived satisfaction with life with diabetes treatment of adolescents with Type 1 diabetes, as well as their worries related to diabetes and its impacts on daily life that affect their physical, psychological, and social well-being.

Component of Quality of Life

Although there is no universally agreed definition of quality of life, most experts would agree that quality of life comprises of both positive and negative factors of life and is a multidimensional concept. Additionally, many experts agree on the subjective evaluation of well-being rather than the healthcare professional's view and dynamic of the concept (Gant, Padilla, Ferrel, & Rhiner, 1990; Hinds, 1990; Holmes & Dickerson, 1987; Hyland, Kenyon, & Jacobs, 1994; King et al., 1997; Moinpour et al., 1989 cited by King, 1998: 25).

The overall concept of quality of life consists of a number of distinct domains. The five majors domains of quality of life generally referred to by most researchers include the following categories: 1) Physical status and functional abilities, 2) Psychological status and well-being, 3) Social interactions, 4) Economic and/or vocational status, and 5) Religious and/or spiritual status (Spilker, 1996: 2). According to Faulkner (2003: 363), the three underlying dimensions of quality of life are physical, psychological, and social aspects of one's existence affecting life satisfaction and personal well-being. Physical well-being is associated with functional health status, perceived health, physical symptoms, and ability to meet basic needs. Psychological well-being reflects a degree of contentment, productivity,

control, self-perception, and emotional adjustment appropriate to life span development. Social well-being is dependent upon attaining an acceptable level of interaction with friends, support from family members, and role fulfillment. Moreover, Hinds and Varrichio (1996: 530) state that common domains of quality of life in pediatric nursing include physical health (symptom and health condition), psychological/spiritual health (satisfaction with self and orientation toward the future), and family relationships (coping abilities of parents and siblings). However, all of the components are not appropriate to measure in most circumstances, and all domains are not pertinent to study in every study (Spilker, 1996: 3).

Measurement of the quality of life

The goals of healthcare should be not only to increase survival but also to improve optimal quality of life. Quality of life is an increasingly important complement in evaluating the effectiveness of healthcare and is also used for medical decision making, treatment evaluation, and healthcare policy planning. Measurement of quality of life can be done with a variety of instruments and a variety of issues depending on the conceptual framework and objectives of each study.

Measurement of quality of life is viewed as both unidimensional and multidimensional construct. The unidimensional view is that the persons are asked to evaluate their quality of life using one global indicator, and this indicator is valid and reliable (Andrew & McKennell, 1980; Andrew & Withey, 1976; Cantril, 1963 cited by Hanucharunkul, 1988: 35). On the other hand, the multidimensional view is that persons evaluate their quality of life based on a number of criteria.

Besides, measurement of quality of life can use both subjective and objective measure of dimensions. Ferrans & Power (1985: 16-17) have classified assessment of quality of life based on indicators into 1) subjective indicators and 2) objective indicators. Subjective indicators assess the experience of life directly, whereas objective ones merely measure things that influence that experience. Moreover, quality of life assessment can reflect the image of subjective data and objective data. The objective data can be measured directly by the assessor including educational level, occupation, income, functional status, metabolic control, ability in daily living, and related environment. On the other hand, the subjective data are the feeling or perception that people have toward themselves such as life satisfaction, well-being,

happiness, self-esteem, etc. (Frank-Stromborg, 1984; Meeberg, 1993; Zhan, 1992 cited by Wanthana, 2003: 23).

Other types of quality of life measure can be evaluated either through generic or disease-specific quality of life. Generic measures are used in general populations to assess a wide range of domains applicable to a variety of health states, conditions and diseases. They are usually not specific to any particular disease states or susceptible population of patients and are therefore most useful in conducting general survey research on health and making comparisons between disease states. On the other hand, disease-specific measures focus on the domains most relevant to the disease or condition under study and on the characteristics of patients in whom the condition is most prevalent. Disease-specific instruments are most appropriate for clinical trials in which specific therapeutic interventions are being evaluated (Testa & Simonson, 2004: 837-838) because they achieve a greater responsiveness and sensitivity (Patrick & Deyo, 1989: 217-232; Fletcher et al., 1992: 1145-1148 cited by Bott et al, 1998: 757). However, there is a general consensus to use generic measures supplemented with disease-specific measures for outcomes in quality of life trials (Spilker, 1996: 9).

Instruments used to measure QOL in adolescents with Type 1 diabetes

Many instruments have been developed to measure quality of life (QOL) for diabetic persons, but the most frequently used approach in nursing is that of the multidimensional, disease-specific, patient-report, single scale (Hinds & Varrichio, 1996 :531). Seven instruments meet these criteria; that is, the Appraisal of Diabetes Scale (ADS), Audit of Diabetes-Dependent Quality of Life (ADDQoL), Diabetes Health profile (DHP-1), Diabetes Impact Measurement Scale (DIMS), Diabetes Quality of Life Measure (DQOL), Diabetes Quality of Life for Youth Measure (DQOLY), the Diabetes-Specific Quality of Life Scale (DSQOLS), and PedsQL 3.0 Type 1 Diabetes Module. However, Diabetes Quality of Life for Youth Measure (DQOLY) was selected to determine the impact on quality of life in adolescents with Type 1 diabetes in the present study. The Diabetes Quality of Life for Youth (DQOLY) was modified by Ingersoll & Marrero (1991) from the original DQOL which was developed by the DCCT Research Group (1987). The Diabetes Quality of Life Measure (DQOL) was the first diabetes-specific quality of life measure

developed in 1987 for use in the Diabetes Control and Complication Trial (DCCT) by a multidisciplinary team. It is a multidimensional construct and a self-report measure that assesses subjective evaluation of the impact of diabetes on their function. The DQOL instrument is conceptualized as measuring the patients' personal experience about burden of diabetes treatment regimen. Four separate areas are addressed by the measure: satisfaction with treatment (18 items), impact of treatment (27 items), worry about the future effects of diabetes (11 items), and worry about social/vocational issues (three items) (DCCT, 1998). It consists of 46 core items and a single overall well-being scale. Moreover, the DQOL includes 13 items to assess adolescent populations who are in school and/or living at home with parents. As the original Diabetes Quality of Life (DQOL) adolescent version was designed specifically for use with children and adolescents, and the Satisfaction with Life Scale was found to be confusing, Ingersoll & Marrero (1991) modified the DQOL for specific use in young diabetes populations in their study.

The revised instrument Diabetes Quality of Life for Youth (DQOLY) was shortened, and school and peer related questions were added while the wording was simplified. It consists of three subscales parallel to the original DQOL. In the preliminary analysis of the DCCT version of the DQOL, items of limited value for children and adolescents were dropped, such as "How satisfied are you with your sex life?" and "How often do you worry about whether you will be denied insurance?" In addition, items related to school life and peers were included. Therefore, all 17 items of the Life Satisfaction Scale contribute to the overall scale. The Disease Impact Scale was modified to 23 items by removing four items ("How often do you have low blood sugar?," "How often does your diabetes interfere with your sex life?," "How often do you tell others about your diabetes?," and "How often do you find that close family members...tease you about your diabetes?"). Furthermore, the Disease Related Worries Scale was modified to consist of 11 items by removing three irrelevant items ("How often do you worry about whether you will be denied insurance?," "How often do you worry about whether you will miss work?," and "How often do you worry about whether you will be able to take a vacation or a trip?"). Content validity was established by the independent review of a pediatric diabetologist, a nurse practitioner, a social worker, and an educational psychologist, all of whom were specialized in

pediatric diabetes care. Next, the items were tested with 15 adolescents aged 11 to 18, which led to simplification of wording of the questions and response format. Alpha coefficients for the three subscales of the 17-item Diabetes Life Satisfaction, 23-item Disease impact, and 11-item Disease-Related Worries were 0.85, 0.83, and 0.82, respectively (Ingersoll & Marrero, 1991: 114-118).

In summary, Diabetes Quality of Life for Youth Measure (DQOLY) was diabetes-specific quality of life measure that can be used specifically with adolescents with Type 1 diabetes. Reliability levels have been demonstrated by high Cronbach's alpha coefficient scores. Moreover, DQOLY measure has widely been utilized to study QOL of adolescents with Type 1 diabetes on a large international scale. This instrument is also relevant with the conceptual framework of Orem's Self Care Model (Orem, 1995). Based on these reasons, the DQOLY measure was selected to assess QOL of diabetic adolescents in the present study.

Effect of diabetes on quality of life of adolescents with Type1 diabetes

For adolescents living with diabetes, an incurable illness, the treatments are burdensome and the complications can be debilitating and life-threatening (Bouma & Schweitzer, 1990). It can affect every aspect of diabetic adolescents' everyday life and is a stressful event influencing the quality of life. Thus, the individuals with diabetes need to find ways to live a meaningful life despite their illness (DeSouza & Nairy, 2003: 63). The aspects of life with diabetes that may affect adolescents' quality of life include the never-ending demands of diabetes care, such as eating carefully, exercising, monitoring blood glucose, scheduling medical appointments, planning for uncertainty of symptoms of low or very high blood glucose, and dealing with fears about or the reality of complications. The effects of Type 1 diabetes on adolescents' life are summarized as follows:

1. Physical aspects: When diagnosed with Type 1 diabetes, adolescents face a lifetime of potential sequelae from the disorder (Leonard et al., 2002: 28). There are three major ways in which Type 1 diabetes can have negative impacts on adolescents' physical well-being. The most potent factor is chronic complications of diabetes including retinopathy (with potential loss of vision or blindness), nephropathy (leading to renal failure), peripheral neuropathy (increased risk of foot ulcers,

amputation, and Charcot joints), and autonomic neuropathy (gastrointestinal and bladder dysfunction) (Herman, 1999:104). When adolescents have developed chronic complications, they may be unable or less able to attend school, to work, to complete household tasks, or to enjoy pleasurable activities. Their ability to function independently may be impaired as well (Polonsky, 2000). They also feel suffering from discomfort due to pain (Aalto et al., 1997: 222), more physical symptoms, and increased susceptibility to certain infections (Herman, 1999:104), leading to perception that their overall health and physical functioning are worsened (Lyoyd et al., 1992: 166-172; Padgett, 1993: 123-129 cited by Aalto et al., 1997: 222) and their quality of life is reduced (Polonsky, 2000).

The second factor is acute complications. The most frequent acute complications include hyperglycemia, hypoglycemia, and diabetic ketoacidosis (Cara, 1999). Hyperglycemia cause numerous physical symptoms leading to complaints of the classic hyperglycemia triad including thirst, polyuria, and weight loss (Sonnaville et al., 1998: 919), as well as increased fatigue, sleep problems (Polonsky, 2000), more frequent infections (Herman, 1999: 104), and other associated problems. Furthermore, lipohypertrophy is also unpleasant side effects resulting from repeated insulin injections (Polonsky, 2000). Moreover, poorly controlled diabetes in adolescents can impair growth and delayed pubertal development (Orr et al., 1983: 171; ISPAD Consensus Guidelines, 2000: 102; Pek 2002: 280), as well as delayed maturation (Hauser et al., 1983: 325-332 cited by Jacobson et al., 1997: 811). In girls, menarche may be delayed and also loss of regular menses cycle (Boland & Grey, 2000: 433).

On the other hand, tight metabolic control from intensive treatment leads to increased feeling of burden through highly complex demanding self-care regimens (Rubin, 2000) and causes unwanted weight gain, more frequent hypoglycemia (Herman, 1999: 105), and/or loss of hypoglycemic warning signs (Polonsky, 2000). Warning symptoms of hypoglycemia include earlier autonomic symptoms such as hunger, sweating, or nervousness (Tkacs, 2002: 37). If hypoglycemia remains undetected, neuroglycopenia occurs and behavioral changes such as tearfulness, irritability, or unusual restlessness will take place (Tkacs, 2002: 37). Severe hypoglycemia can bring about episodes of coma and/or seizure (Leonard et al., 2002:

28). Therefore, adolescents have a higher rate of hospitalizations and emergency visits due to both diabetic ketoacidosis and hypoglycemia (Tkacs, 2002: 37).

The third factor concerns physical symptoms and lifestyle changes resulting from demands of the Type 1 diabetes regimen. Individuals are forced to limit or curtail their activities in order to manage their diabetes effectively including declining late-night social engagements as a means to avoid dietary lapses or losing one's license to drive due to frequent and severe hypoglycemia (Polonsky, 2000). Adolescents with diabetes often face restriction in the amount, types, and timing of food consumption (e.g., having meals at certain times, waiting for insulin effect before eating, and having between meal snacks, etc.). These restrictions may negatively affect individuals' perceptions of life quality.

To assess this dimension effectively, evaluation might focus on the adolescents' perceived physical distress due to specific symptoms of diabetes as well as the perceived loss of physical function, interference with common role activities including schooling, career choices, leisure activities (Davidson et al., 1997: 65), work, tasks at home, social and recreational pastimes, and loss of independence due to diabetes (Polonsky, 2000).

2. Psychological and emotional aspects: Living with Type 1 diabetes is often difficult and confusing to manage in adolescence period because demands of diabetes care can have a potent impact on adolescents' mood, both short-term and long-term, and they must face with many sources of potential emotional distress including: 1) uncertainty about the outcome of the immediate situation, 2) guilt or anger about the occurrence of diabetes, 3) feelings of incompetence and helplessness over the responsibility for management of the disorder, 4) fears about future complications and shortened life span, 5) concerns about life goals and aspirations, and 6) recognition of the need for a permanent change in lifestyle (Harris & Holvey, 1991: 688). Adolescents with diabetes may be frustrated, discouraged, and/or enraged with a disease that often does not seem to respond to their best efforts. They may also feel hopeless or despondent about the possibility of avoiding long-term complications. Feeling of helplessness may be attributable to a disastrous cycle of self-care that will worsen with poor metabolic control and depressive symptoms (Pita et al., 2002: 46). Also, feelings of guilt and discouragement, as well as of being overwhelmed or

burned-out, may be experienced. It can be a difficult, emotional struggle to find a way to include diabetes in one's life and to confront the sense of mortality that diabetes may represent (Polonsky, 2000).

Moreover, adolescents with Type 1 diabetes face a tremendous burden, demanding continuous adjustment and adaptation with the stressors in everyday life (Kanner et al., 2003: 15). Stressors and coping styles during the period of adolescence are often associated with neglect of self-monitoring, dietary recommendations, and insulin injections (Hanson et al., 1989: 644-651; Delamater, et al., 1987: 136-140; LaGreca, Follansbee, & Skyler, 1990: 132-139). Consequently, adolescents with diabetes have high risks for poor metabolic control, hospitalization, and development of long-term complications (Grey et al., 1998: 902). Poor metabolic control may lead to persistent fatigue, which can exacerbate depressed mood and psychiatric problems (Welch et al., 1997: 760) such as anxiety, affective disorders (Jacobson et al., 1997: 11), eating disorders, and also increased risk for suicidal ideation (Jacobson et al., 1997: 811). Furthermore, unpredictable hypoglycemia can be viewed as a loss of self-control (Harris & Holvey, 1991: 689) and frequent hypoglycemic episodes can also be exhausting, debilitating, discouraging, and potentially quite frightening (Polonsky, 2000).

Besides, phobic disorders such as needle phobias, fear of blood, fear of self-monitoring of blood glucose values, and fear of self-injection of insulin are frequently a barrier to the self-management of diabetes. Adolescents are likely to have a greater incidence of depression (Cara, 1999). This is not uncommon, and, when present, can have a negative impact on diabetic control and care (Canadian Diabetes Association, 2003: S50). In addition, fear about diabetes complications that may develop in the future including blindness, amputation of limbs (particularly the legs), and kidney failure (Kyngas & Barlow, 1995: 941-947 cited by Kyngas, 2000: 265) and fear of hypoglycemia may pose a threat to physical, emotional, and social well-being. To assess this dimension effectively, evaluation might focus on the adolescents' perceived emotional distress due to diabetes-related symptoms, self-care, relevant problematic situations, and broader diabetes issues (Polonsky, 2000).

3. Social aspects: The restrictions of freedom and disruption of relationships with peers, siblings, and parents are the major consequences of such chronic illnesses

as diabetes (Seiffge-Krenke, 1996 cited by Kyngas, 2000: 265). As youths transition into adolescence, they spend increasing amounts of time with peer at school. Strong peer relationships are fundamental for the development of social skills, a healthy self-concept, future emotional adjustment (Auria et al., 2000: 175), and can provide positive role model and group activities (NDEP, 2004). Moreover, close peer relationships are an important source of support for chronically ill adolescents, during the time when they have to tackle both developmental tasks and disease-related challenges (Miller-Johnson et al., 1994: 603-610 cited by Kyngas, 2000: 261).

Increasing severity of diabetes can lead to frequent and lengthy school absences (Orr et al., 1983: 170), as well as frequent hospitalizations and emergency visits (Tkacs, 2002: 37). These illness-related events can separate these adolescents from unaffected peers, interrupting their ability to build successful peer relationships (Auria et al., 2000: 176). Social isolation is frequent in this group as well (Orr et al., 1983: 170; Lloyd et al., 1993: 481-485 cited by Jacobson et al., 1997: 811). Some adolescents may be reluctant to participate in sports, social activities, or dating or even to go out with friends for an ice-cream because they are not confident in their ability to adjust their insulin. In addition, other adolescents may want to hide their diabetes from their friends and classmates, and they may skip glucose level checks or injections while at school (JAAPA, 2002).

In addition, adolescents with diabetes need to take insulin, check their blood glucose several times during the day, and remember to make correct food choices. These tasks can make them feel different from their peers and bothersome (NDEP, 2004). When they have not been successful at achieving excellent metabolic control, friends or family members may begin to push for self-care changes even when the adolescents are unwilling to make them. As loved ones begin acting like “diabetes police,” the opportunities for interpersonal conflicts escalate (Polonsky, 2000). Pressure by their family and physician to produce good blood glucose levels may contribute to deception such as fabrication of blood glucose test results. Also, peer pressure and a desire to conform may contribute to deviations from diet and schedule (Glasgow, 1992: 324). Moreover, conflicts with healthcare staff are common among the adolescents who exhibit poor diabetic control. Lying is a common feature in these conflicts because they believe that if they report the real state of things, they run the

risk of receiving negative responses from the physicians and nurses; thus, these adolescents give physicians and nurses the kind of answers they expect them.

What's more, diabetes is often seen in the form of stigma like following a special diabetic diet, delayed marriage, and reduced job opportunities (Diabetes Forum, 2004). Individuals with diabetes are concerned with delayed marriage as well as the danger of pregnancy, including the transfer of the genetic predisposition for diabetes to one's offspring (Harris & Holvey, 1991: 690). Employment opportunities are also major concerns of many adolescents (Seiffge-Krenke, 1996 cited by Kyngas, 2000: 265). To assess this dimension effectively, evaluation might focus on the adolescents' perceived emotional distress due to diabetes-related social situation (Polonsky, 2000).

4. Economic/Financial aspects: Type 1 diabetes causes a heavy economic and financial burden on both individuals (Gilbert, Christensen, & Conway, 2004) and the society (Hahl et al., 2002: 427). The family and the adolescents with diabetes are faced with economic burdens where increasing cost of insulin, blood tests and other medical expenses must be met (Diabetes Forum, 2004). The burdens of out-of-pocket healthcare costs are increasing from intensive therapy which requires regular and frequent blood glucose testing and insulin adjustments, as well as regular contacts with healthcare professionals. This regimen is integral for preventing both short- and long-term complications of diabetes (Songer et al., 1997: 577). In addition, poor metabolic control plays a significant role regarding the need for additional medical intervention due to diabetes complications. These complications result in costly healthcare expenditures such as hospitalization and skilled nursing facility care, and they also bring about disability and premature death (Gilbert, Christensen, & Conway, 2004). As such, adolescence diabetes becomes a burden to the society which, in turn, can adversely affect the development of the country as a whole. This financial burden may contribute to decreased quality of life.

In summary, when having Type 1 diabetes, a chronic lifelong and incurable disease, adolescents with diabetes have to tackle both developmental tasks and disease-related challenges. The demands of diabetes self-care can be burdensome, frustrating, and overwhelming, and they also interfere with the adolescents' opportunities for normal development experiences. This is because adolescents living

with Type 1 diabetes must face with many sources of stress in their lives such as uncertainty, life-threatening events, fear of complications, low self-esteem, sense of helplessness, and feeling of being different from their peers. Besides, the continuous burdens of diabetes and its treatments affect adolescents' common role activities including schooling, career choices, leisure activities, work, tasks at home, and social and recreational activities. In brief, the diabetes burdens have profound impacts on physical, psychological, and social quality of life of adolescents with Type 1 diabetes, with influencing factors changing over time throughout their life. Therefore, it is important for the nurses to help adolescents and family to seek ways to normalize their lives with Type 1 diabetes as much as possible by assessing, sustaining, and improving their quality of life.

There are a group of pervious studies which examined the factors influencing quality of life in adolescents with Type 1 diabetes using the DQOLY measure and other measure as follows:

In a study of 52 adolescents with Type 1 diabetes aged 13-20 years with mean age of 16.1 years and mean diabetes duration of 8.2 years, Grey et al. (1998: 909-914) found that adolescents with Type 1 diabetes had greater impact ($R^2 = 0.48$), were less satisfied ($R^2 = 0.45$), felt that management was more difficult ($r = 0.56$), and felt that diabetes was more upsetting ($r = 0.63$). They also used fewer rebellion strategies for coping ($r = -0.44$), had diabetes self-efficacy ($r = -0.36$), and had more depressive symptoms ($r = 0.61$). Higher impact was also associated with higher family warmth and caring ($r = -0.54$) and lower family adaptability ($r = -0.42$). Adolescents who were worried about their diabetes ($R^2 = 0.37$) felt that management was more difficult ($r = 0.40$) and diabetes was more upsetting ($r = 0.58$), and they used less rebellion ($r = -0.49$) and more ventilation to cope ($r = 0.42$). Also, they had lower diabetes ($r = -0.40$) and medical self-efficacy ($r = -0.30$), and they were more depressed ($r = 0.55$). Finally, their families were less warm and caring ($r = -0.33$). Furthermore, HbA1c levels were not associated with quality of life or any other psychosocial factors except in adolescents who perceived their families as providing more guidance and control. These adolescents had lower HbA1c values than those whose families were less involved.

Besides, Grey et al. (1998: 902-908) conducted an experimental study with 65 adolescents with Type 1 diabetes aged 13-20 years with an aim to determine the effects of a behavioral intervention program (coping skills training [CST]) combined with intensive diabetes management) on improvement of metabolic control and quality of life of adolescents with Type 1 diabetes by using DQOLY measures. The findings indicated that adolescents who received CST had lower HbA1c and better diabetes self-efficacy and were less upset about coping with diabetes than adolescents receiving intensive management alone. In addition, adolescents who received the CST found it was easier to cope with diabetes and experienced less negative impact of diabetes on quality of life than those who did not receive CST.

Faro (1999: 247-253) studied the impact of diabetes on overall quality of life of 23 adolescents aged 12-16 years. The impact of diabetes on daily life, satisfaction with life, and common worries and frustration were explored through the Diabetes Quality of life for Youth scale (DQOLY) and semi-structured interviews. The four major themes that emerged from the interviews were (a) restrictions, (b) differentness, (c) negative emotion, and (d) adaptation. Adolescents reported being most bothered by dietary restrictions, including the regimentation/scheduling of eating and its social ramifications. Adolescents in this study worried the most about the future and, in particular, complications. The theme of adaptation and the negative emotion theme were both expressed most often by participations who had had diabetes for a longer period of time. Besides, total Quality of Life scores reflected better quality of life, and the health rating of participants was also significantly correlated with HbA1c, with higher HbA1c (poor metabolic control) associated with more negative self-ratings of overall health on the DQOLY.

Faulkner (2003: 362-368) conducted descriptive correlation research aiming to study quality of life of 69 adolescents with Type 1 diabetes aged 15-25 years in comparison with 75 healthy adolescents. Comparisons of quality of life of adolescents with diabetes and health control was conducted using the Functional Status II (R), Child Behavior Checklist Social Competency Scales (CBCL), Self-Perception Profile for Adolescents (SPPA), and the global measure of health and life satisfaction from the DQOLY. According to the study findings, adolescents with Type 1 diabetes perceived their health to be significantly lower (mean = 3.16, mean = 3.40, $p = .045$)

and experienced more decreased life satisfaction ($t = -2.4$, $df = 114.5$, $p = .02$) when measured by DQOLY than the control subjects. However, no significant differences in measures of quality of life by the Self-Perception Profile for Adolescents were found.

In another study, Bott et al. (1998: 757-769) aimed to validate a diabetes-specific quality of life scale (DSQOLS) and to assess the quality of life of 657 patients aged >13 years with Type 1 diabetes in Germany. They found that all six subscales (social relations, physical complaints, worries about future, leisure time flexibility, diet restrictions, and daily hassles) were significantly correlated with a validated well-being scale ($r = 0.28$ to 0.43 , $p < 0.001$). Physical complaints ($r = 0.24$) and worries about the future ($r = 0.17$) had the highest correlations with HbA1c ($p < 0.001$). Also, a flexible insulin therapy, a liberalized diet, the absence of late complications, and a higher social status were significantly associated with more favorable scores in different domains.

In Thailand, Banchang Sukcharearn et al. (B.E.2545) investigated quality of life and the relationship between some factors related to quality of life in children with Type 1 diabetes aged seven to 20 years and found that the overall quality of life was in a good level. As regards the four components of quality of life, it was found that life satisfaction was at a very good level, while the other three components—self concept, health status factors, and socio-economic components—were at a good level.

Besides, Sudjai Samithitikan (B.E.2541) studied quality of life and factors related to quality of life of school age children seven to 13 years old with a chronic illness including heart disease, nephrotic syndrome, diabetes, and thalassemia. She found that the participants had good quality of life as defined by receiving a good response to basics minimal needs and health such as normal growth, no sickness, and no hospitalization.

In summary, quality of life has been recognized as an important outcome of medical treatment and has become a core issue in diabetes care than the traditional outcomes. From a review of the literature related to quality of life (QOL) in children and adolescents, most of the previous studies were carried out in western countries and there is the gap of knowledge. The conceptual frameworks and definitions of quality of life utilized in nursing research were mostly adopted and modified from the

western frameworks and perspectives, which needed further testing and validation by research conducted specifically in the Thai context. Thus, the researcher was interested in conducting a study to determine factors influencing on quality of life in adolescents with Type 1 diabetes by using the Thai version of the DQOLY measure.

Factors Influencing Quality of Life of Adolescents with Type 1 Diabetes

In this study, the factors influencing quality of life of adolescents with Type 1 diabetes were investigated. Based on the review of literature, the selected predictors were self-care behaviors and basic conditioning factors including gender, family income, duration of diabetes, and metabolic control. These selected predictors are described below.

Gender: Gender is a factor to classify the physical differences of human being and it is also controlled by social role (Murray & Zentner, 1989: 5). Moreover, it has also been identified as an individual factor associated with behavioral problems (Black, Richado, & Stanton, 1997 cited by Rew & Horner, 2003: 381) and coping response (Copeland & Hess cited by Rew & Horner, 2003: 381). Sex differences affect QOL differently in male and female patients of diabetes. Girls enter puberty at an earlier age than boys and have more unsatisfactory blood glucose control for a number of reasons. These may involve decreasing adherence to different aspects of the treatment regimen and decreasing insulin sensitivity of peripheral tissues. These changes in metabolic control may affect QOL differently in male and female patients. In addition, females, when compared to males, appear to experience a greater impact of diabetes on their quality of life and, in particular, experience more worried about complications and hypoglycemia (Jacobson et al., 1997: 11-20). Likewise, the Hvidore Study Group (Hoey et al., 2001: 1923-1924) conducted a study with 2,101 adolescents with diabetes aged ten to 18 years from 21 centers in 17 countries in Europe, Japan, and North America and found that gender was correlated with quality of life. To explain further, girls showed increased worries ($p < 0.01$), less satisfaction, and poor health perception ($p < 0.01$) earlier than boys. In addition, Graue et al. (2003: 1190-1196) explored health-related quality of life in 115 adolescents with Type 1 diabetes aged 11-18 years and found that females had lower mental health

than males ($p < 0.001$), and females also reported a greater impact of diabetes ($p = 0.028$), more worries ($p = 0.001$), and less satisfaction with life ($p = 0.006$) than males. Moreover, although in a study carried out by Faulkner (2003: 362-368) gender was not correlated with worries and impact of the DQOLY subscales, it was correlated with the life satisfaction subscale, with females having lower life satisfaction than males.

Duration of diabetes: Orem (1985: 120) believes that the ability to take care of oneself varies according to the persons' illness experience that interacts to influence the attitude that predisposes the patients to engage in self-care. Long length of illness will increase the experience and develop skill in self-care. Duration of diabetes is one of the factors affecting resolution of problems and adaptation of ill people because individuals need time for adaptation, and when time has passed the individuals will behave according to the physician's management (Friedland & McColl, 1987: 475). There is evidence that longer duration of diabetes is associated with deficits in quality of life (Peyrot & Rubin, 1997: 585-590; Glasgow et al., 1997: 562-567; Aalto et al., 1997: 215-225; Klein et al., 1998: 236-240 cited by Maddigan et al., 2003). Support could be found in the study of Elbagir et al. (1999: 71) which revealed that increased diabetes duration has a deteriorating effect on the quality of life, at least for perception of general health, body pain, and sleep problems. However, it is inconsistent with study by Sudjai Samithikarn (B.E.2541: 68) conducted with school age children aged seven to 13 years with chronic illnesses including heart disease, nephrotic syndrome, diabetes, and thalassemia which found that duration of diabetes was positively correlated with quality of life ($r = .1348$, $r < .05$). Similarly, Ingersoll & Marrero (1991) conducted a study with 74 children and adolescents aged 10.8 to 21.8 years with mean duration of diabetes of 5.6 years and found that shorter duration of diabetes was associated with greater disease impact.

Family income: Income is an indicator of social and economic status, and it is a very important factor determining way of life in which individuals can respond to the basic needs and have the ability to perform self-care (Pender, 1982: 163). Individuals with high family income will have a better opportunity than those with low family income in seeking facilities for suitable health services and healthy self-

care practices (Pender, 1982: 161-162). In addition, availability of socioeconomic resources allows individuals to focus their efforts on getting well (Weisman, 1979 cited by Hanucharurnkul, 1988: 17), and it may be related to psychological well-being; that is, a sense of security and self-esteem. It is also related to the coping resources available to individuals (Zhan, 1992: 779). According to Orem (1985: 175), availability of resources will affect the well-being of the family. As such, low family income means resource deficits, thereby contributing to negative health outcomes (National Center for Health Statistics [NCHS], 2002 cited by Rew & Horner, 2003: 380). In this way, income may contribute to the quality of life of individuals. Therefore, it is postulated that family income will influence quality of life both directly and indirectly. A study of Banchang Sukcharearn et al. (B.E.2545: 78-87) found that family income was positively correlated with quality of life ($r = 0.237$, $p = .05$). Similar finding was reported in the study of Sudjai Samithtikarn (B.E.2541: 68) conducted with school age children aged seven to 13 years with chronic illnesses including heart disease, nephrotic syndrome, diabetes, and thalassemia that duration of diabetes, education level of the mother, and family income were positively correlated with quality of life ($r = .4607$, $p < .001$). Education level of the mother and family income could co-predict QOL by 30.37%.

Metabolic control: Metabolic control problems, especially chronic hyperglycemia and recurrent diabetic ketoacidosis (DKA), are likely to lead to increased health complications (DCCT, 1994: 177-188 cited by Delamater et al., 1999: 700) and reduced quality of life (Delamater et al., 1991: 20-25). Furthermore, frequent metabolic disorders diminish the quality of life in physical as well as social aspects (Bendtsen, 1993: 141-152 cited by Rose et al., 1998: 1876), whereas analogously, good metabolic control is associated with less anxiety, less depression, and greater self-confidence (Dupuis et al., 1980: 581-591 cited by Rose et al., 1998: 1876), as well as increased sense of self-control. Therefore, the changes in metabolic control may affect quality of life. The Hvidore Study Group (Hoey et al., 2001: 1923-1928) conducted a large international cohort study in 2,101 adolescents with diabetes aged ten to 18 years and their families from 21 centers in 17 countries in Europe, Japan, and North America to determine the relationship between metabolic control and

quality of life. In this study, adolescents' QOL was assessed by DQOLY which was translated into 14 languages. The findings indicated that lower HbA1c was associated with lower impact ($p < 0.0001$), fewer worries ($p < 0.05$), greater satisfaction ($p < 0.0001$), and better health perception ($p < 0.0001$) for adolescents. Parents and health professionals assessed family burden using newly constructed questionnaires and found that parents' and health professionals' perceptions of burden decreased with age of adolescents ($p < 0.0001$). Therefore, this study concludes that better metabolic control is associated with better QOL for adolescents and with a lesser perceived burden by parents and health professionals. These findings were consistent with the study of Guttman-Bauman et al. (1998: 915-918) conducted with 69 adolescents with Type 1 diabetes aged ten to 20 years with a mean age of 15 years. It was found that the DQOLY scores were correlated with the mean HbA1c ($\beta = 6.13$, $R^2 = 0.22$, $p = 0.0122$) and single HbA1c ($\beta = 3.94$, $R^2 = 0.18$, $p = 0.05$). Furthermore, self-health assessment was the best predictor of DQOLY scores ($\beta = -44.42$, $R^2 = 0.45$, $p < 0.0001$). The worries subscale score on DQOLY was correlated with the occurrence of acute events ($\beta = 6.97$, $R^2 = 0.2$, $p = 0.006$), but was not correlated with either HbA1c level. Finally, correlations of mean HbA1c with the predictors were stronger than the correlations of single HbA1c with the same predictors. Similarly, Rubin & Peyrot (2000: 934-942) have reported that better quality of life is associated with lower HbA1c levels. In addition to these studies, Faulkner (2003: 362-368) studied quality of life in adolescents with Type 1 diabetes aged 15 to 25 years and found that both recent HbA1c ($\rho = -.28$, $p = .03$) and average HbA1c ($\rho = .36$, $p = .004$) were significantly correlated with health perception. Moreover, Bott et al. (1998: 757-769) examined quality of life of 657 patients aged >13 years with Type 1 diabetes in Germany using a diabetes-specific quality of life scale (DSQOLS) consisting of six subscales (social relations, physical complaints, worries about future, leisure time flexibility, diet restrictions, and daily hassles). They found that physical complaints ($r = 0.24$) and worries about the future ($r = 0.17$) were correlated with HbA1c ($p < 0.001$). These findings related to metabolic control were in congruence the findings of previous research, but inconsistent with the study of Ingersoll & Marrero (1991) conducted with 74 children and adolescents aged 10.8-21.8 years which found that none of DQOLY scales was related to metabolic control as

measured by HbA1c. Likewise, Faro (1999: 247-253) also found that total DQOLY scores did not correlate with metabolic control in 23 adolescents aged 12-16 years. Finally, Graue et al. (2003: 1190-1196) investigated health-related quality of life in 115 adolescents with Type 1 diabetes aged 11-18 years and discovered that neither HbA1c nor other clinical variables could sufficiently explain the variations in DQOLY.

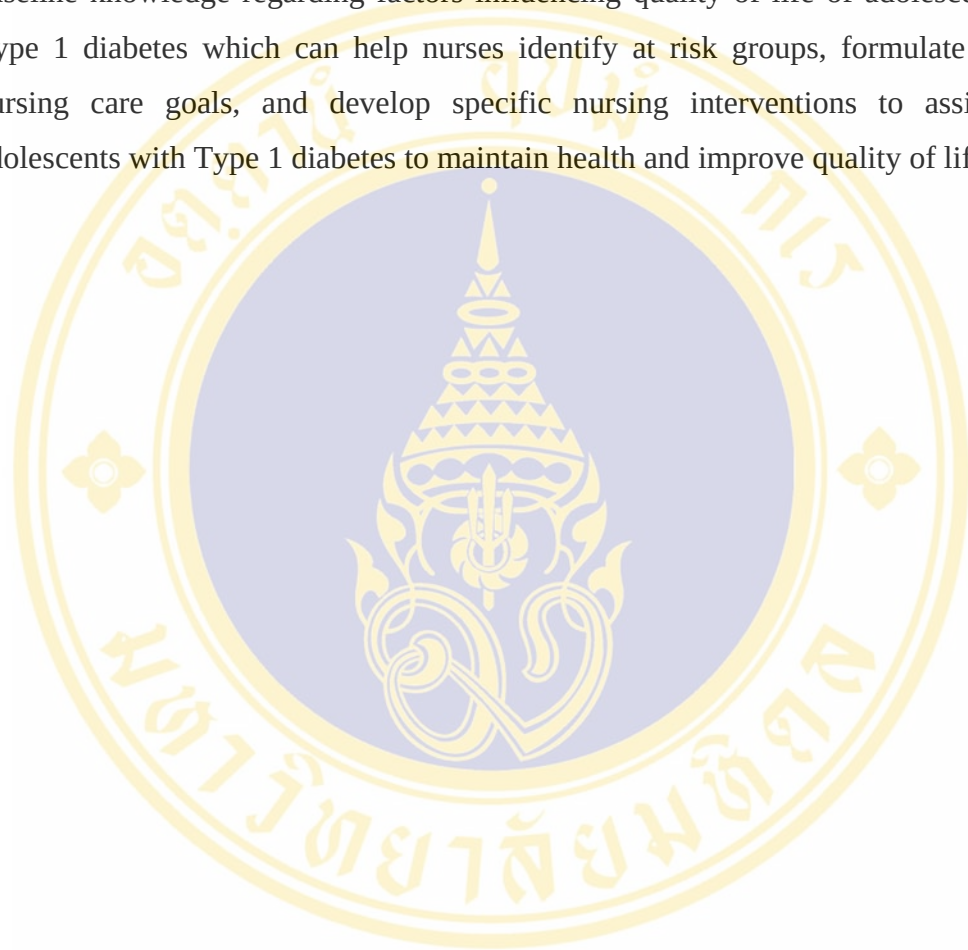
Self-care behaviors: According to Orem (1995), self-care behaviors can be defined as the practice of activities adolescents with Type 1 diabetes initiate and perform on their own behalf in the management of their disease in daily lives in order to maintain life, health, and well-being or quality of life. Adolescents with Type 1 diabetes who have performed appropriate self-care behaviors in their treatment regimen are likely to perceive better physical health and mental health outcomes through perceived control or self-regulation. Consequently, they perceive good quality of life. Therefore, performing self-care behaviors is positively correlated with quality of life (Aalto et al., 1997: 222). For instance, Kyngas & Hentinen (1995: 729-736) found that adolescents with diabetes who had good self-care behaviors perceived better health and well-being. Banchang Sukcharearn et al. (B.E.2545: 78-87) also found that self-care behaviors of adolescents aged seven to 20 years with Type 1 diabetes are positively correlated with quality of life ($r = 0.446$, $p = .001$).

Summary

Type 1 diabetes is a chronic illness that threatens physical, psychological, and social well-being and can influence the quality of life. As the treatments are burdensome and the complications can be debilitating and life-threatening, they can bring about a stressful experience not only for the children and adolescents themselves but also for the whole family. Adolescents with Type 1 diabetes usually spend time and effort on self-care throughout their life in order to control the disease. Moreover, self-care behaviors are important and necessary to maintain life, health, and well-being or quality of life of these diabetic adolescents.

From the review of literature and related studies discussed above, it was found that self-care behavior is an important factor related to quality of life. However,

quality of life may be determined by basic conditioning factors including gender, family income, duration of diabetes, and metabolic control. Thus, the researcher intended to determine the influence of these factors on quality of life of adolescents with Type 1 diabetes. It was hoped that the results of this study would provide baseline knowledge regarding factors influencing quality of life of adolescents with Type 1 diabetes which can help nurses identify at risk groups, formulate realistic nursing care goals, and develop specific nursing interventions to assist these adolescents with Type 1 diabetes to maintain health and improve quality of life.



CHAPTER III

MATERIALS AND METHODS

This study was a predictive correlational study which aimed to determine whether adolescents' self-care behaviors and basic conditioning factors including gender, duration of diabetes, family income, and metabolic control could predict the quality of life of adolescents with Type 1 diabetes. The research design, population and sampling, instrumentation, data collection procedure, and data analysis are presented in this chapter.

Population and Sampling

The target population in this study was adolescents with Type 1 diabetes aged 12-18 years who received treatment or medical services at the Endocrine Clinic, Pediatric Out-Patient Unit in four tertiary medical centers of the Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and Pramongkutkloa Hospital. The subjects were purposively selected using the following inclusion criteria:

1. They had been diagnosed with Type 1 diabetes for at least one year prior to the data collection date (to avoid “honeymoon phase effects,” as well as effects from the “newness of diagnosis”).
2. They had experience of undergoing insulin therapy.
3. They were able to perform daily living activities.
4. They were in school as appropriate to their age and were able to read, write, and communicate in the Thai language.
5. There was no evidence of mental retardation or any other psychiatric disorders.
6. The most recent HbA1c monitoring was conducted less than three months previously.
7. Both caregivers and the adolescents agreed to participate in this study and gave their written consent as a result.

The exclusion criteria were as follows:

1. They had co-morbidity from other chronic diseases such as asthma, thalassemia, and leukemia.
2. They had acute exacerbation from severe hypoglycemia, ketoacidosis, and/or hospitalization during data collection

A power analysis was used to determine the sample size as proposed by Polit's (2003: 521) which was the most widely used method for multiple regression analysis. To calculate multiple regression, the estimated population effect size was as follows:

$$\gamma = \frac{R^2}{1 - R^2}$$

Next, the following formula was applied:

$$N = \frac{L}{\gamma} + k + 1$$

Where N = estimated number of subjects needed
 L = table value for the desired alpha and power
 K = number of predictors
 γ = estimated effect size

In this study the researcher used five predictor variables, with a moderate effect of .13 ($R^2 = .13$), a power of .80, and an alpha of 0.05. With $R^2 = .13$, the estimated population effect size (γ) was .149 ($.13 \div .87$). According to the Power Analysis Table for Multiple Regression, the value of L was equal to 12.83. Thus,

$$N = \frac{12.83}{.149} + 5 + 1 = 92.1$$

Finally, a sample of about 92 adolescents with Type 1 diabetes was needed to detect a population R^2 of .13, with five predictors, and with a 5% chance of a Type I error and a 20% chance of a Type II error.

Setting

Data were collected from the Endocrine Clinic, Pediatric Out-Patient Department, of Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and Pramongkutkloa Hospital.

The characteristics of the settings

Faculty of Medicine, Ramathibodi Hospital: the endocrinology clinic operates on every Monday and Wednesday from 1:00 p.m. to 4:00 p.m. There were three pediatric endocrinologists and a practical nurse working in the pediatric endocrinology out-patient clinic. Adolescents with Type 1 diabetes who had poor control of their condition visited the clinic on a monthly basis or a quarterly basis to maintain good control. There were about two to four adolescents with Type 1 diabetes per visit in this clinic during data collection.

Another service provided for all diabetic adolescents and their families was a monthly group therapy with the multidisciplinary team. Home and school visits were also provided for every newly diagnosed adolescent with diabetes who lived in Bangkok and others who had usual readmission, psychosocial problems, or family conflicts about diabetes care by ambulatory nurses.

King Chulalongkorn Memorial Hospital: the endocrinology clinic operates once a month on the fourth Friday of the month from 8:00 a.m. to 12:00 p.m. There were two endocrinologists and one technician working in the pediatric endocrinology out-patient clinic. There were approximately five to ten adolescents with Type 1 diabetes per visit in this clinic during data collection. All of the newly diabetic adolescents received diabetes education from the multidisciplinary team. Group education was also provided to children and adolescents with diabetes and their families in each visit from 9:00 a.m. to 10:00 a.m. Telephone support was also provided to all patients with diabetes for any problems with their diabetes self-management.

Faculty of Medicine, Siriraj Hospital: The diabetic clinic operates twice a month on the second and fourth Thursdays from 7:00 a.m. to 12:00 p.m. There were the multidisciplinary team comprising an endocrinologist, psychologist, dietitian, technician, and nurse educator working at the diabetic clinic in the pediatric

out-patient department. Group education would be offered to children and adolescents with diabetes and their families by the multidisciplinary team in each visit at 9:00 a.m. to 10:00 a.m. Adolescents with Type 1 diabetes who had poor control had to pay either monthly visits, while those with good control generally paid quarterly visits. There were about ten to 15 adolescents with Type 1 diabetes per visit in this clinic during data collection. A 24-hour hotline service was also provided for any emergency problems with diabetes. Moreover, adolescents who were able to perform diabetes self-care by themselves may be encouraged to attend the diabetes-specific camp which was provided every two years.

Pramongkutkloa Hospital: The endocrinology clinic operates on every Monday from 9:00 a.m. to 3:00 p.m. There are two endocrinologists working in the pediatric endocrinology out-patient clinic. There were generally one to two adolescents with Type 1 diabetes per visit in this clinic during data collection. If the patients and families had any problems and needed special care, the physicians would give them advice or counseling on an individual basis.

Instruments

The instruments of this study were composed of three parts as follows:

1. The Demographic Data Form

The researcher developed the demographic data form in order to collect the data including gender, duration of diabetes, family income, and metabolic control of adolescents with Type 1 diabetes (Appendix D).

2. Quality of Life Questionnaire

The researcher used the Diabetes Quality of Life for Youth (DQOLY) (Ingersoll & Marrero, 1991) to measure diabetic adolescents' quality of life in the present study. This instrument was a modification of the DQOL adolescents' version (DCCT, 1988), consisting of three subscales with a total of 52 items: 17 items on diabetes life satisfaction scale, 23 items regarding disease impact scale; and 11 items on disease-related worries scale. Each item was arranged in a five-point Likert rating scale. A single item of self-rating on overall health status was also included (Appendix F).

Scoring

Responses to the questions were rated with a five-point Likert Scale. Satisfaction was rated from 5 (very dissatisfied) to 1 (very satisfied), and for the reversed scale, the items were rated from 1 (very dissatisfied) to 5 (very satisfied) in the questionnaire before data collection. The impact scale was rated from 1 (never) to 5 (all the time), and the worry scale was rated from 1 (never) to 5 (all the time) and 0 if it was not applicable. As a result, the total scores ranged from 17 to 85 for the satisfaction scale, 23 to 115 for the impact scale, and 11 to 55 for the worries scale.

A method of scoring in the present study had been proposed by Jacobson et al. (1994). Using this method, the patients' impact scores were rated from 1 (never) to 5 (all the time), whereas the reversed impact scores ranged from 1 (all the time) to 5 (never), with the exception of the impact item 7 (negative item). Also, the worry scale was rated from 1 (never) to 5 (all the time) and 0 (not applicable), with the reversed worry scores were rated from 1 (all the time) to 5 (never). Finally, satisfaction scores were reversed in the questionnaire before data collection, and they were rated from 1 (very dissatisfied) to 5 (very satisfied). Higher scores reflected more positive quality of life, and vice versa. The core items were then summed into raw scores for each scale. The raw scale scores were then translated into a 100-point scale, with 0 representing the lowest possible quality of life and 100 representing the highest possible quality of life. The patient's raw score minus the lowest possible score on each scale was divided by the possible score range and multiplied by 100. The formula can be written as follows (Jacobson & DCCT, 2001):

$$\text{Transformed scale} = \frac{[(\text{Raw score} - \text{Lowest possible score})] \times 100}{\text{Raw score range}}$$

The Self-Health Assessment Scale was used to ask the adolescent diabetic patients to compare their own health to the health of others at the same age, using a four-point scale rating (Poor = 1, Good = 2, Fair = 3, Excellent = 4). Higher scores of the self-rate health items reflected more positive rating of personal health.

3. Self-Care Behaviors Questionnaire

Self-Care Behavior Questionnaire was developed by researcher based on the concept of Orem's Self-Care Model (Orem, 1995) and the diabetes self-management education core outcomes measurement (Mulchy et al., 2003). Some items were modified from the diabetes self-care activity measurement developed by Keeratiyutawong (2004) including items 2, 4, 5, 6, 7, 8, 14, 15, 16, 17, and 18. Eight specific behaviors examined in this study included personal hygiene care, dietary control, medication taking, physical activity, self-monitoring, problem solving, stress management, and reducing risk of diabetes complications. The self-care behavior questionnaire consisted of 38 items. The items in the questionnaire were categorized under different subscales as follows: personal hygiene care subscale—three items (items 1, 2, and 3); dietary control subscale—seven items (positive items: items 4, 5, 6, 7, 8, 9, and 18; negative items: items 5, 6, and 7); medication intake subscale—six items (items 11, 12, 19, 20, 21, and 23); physical activity subscale—three items (items 16, 17, and 24); self-monitoring subscale—four items (items 13, 22, 26, and 30); problem solving subscale—eight items (items 10, 14, 15, 25, 27, 28, 29, and 31); stress management subscale—three items (items 32, 33, and 34); and reducing risk of diabetes complications subscale—four items (items 35, 36, 37, and 38). The level of self-care behaviors was determined using a composite score of the following items: 1) the total number of the last seven days the subjects performed the diabetes self-care behaviors in daily life (items 1 to 17), with each item rated with an eight-point rating scale from 0 to 7; 2) Frequency of performing diabetes self-care behaviors with the following events happening to you in the last three months (items 18 to 38), with each item rated with a six-point rating scale from 0 to 5 (from no events happened to always) (Appendix E). Higher scores indicated good self-care behaviors, whereas lower scores reflected poor self-care behaviors.

Scoring

The core items were summed into the raw score for each subscale without reverse scoring, with the exception of dietary control items 5, 6, and 7, with reversed scores as follows: 0 = 7, 1 = 6, 2 = 5, 3 = 4, 4 = 3, 5 = 2, 6 = 1, and 7 = 0).

The percentage scores for overall self-care behaviors and each subscale were calculated by converting the mean standard scores into a percent of the total possible score for the comparison. The formula can be written as follows:

$$\% \text{ of mean} = \frac{\text{mean score}}{\text{the highest possible score}} \times 100$$

Psychometric Properties of the DQOLY Measure

Validity

After the researcher was granted the permission to use the DQOLY instrument in this study by Dr. Gary M. Ingersoll (Appendix A), translation and cross-cultural adaptation of the questionnaire into the Thai version was performed by a forward translation from English into Thai followed by an independent backward translation from Thai back into English. Subsequently, the back translation version was compared with the original version by Dr. Gary M. Ingersoll before the final endorsement.

Content validity were confirmed by a panel of five experts (Appendix B): a pediatric psychologist, a pediatric endocrinologist, two nurse instructors who were experts in nursing theory and development of nursing instruments, and a diabetes advanced practice nurse. These experts examined the instrument to ensure content validity and language appropriateness, and the researcher revised and improved the questionnaire based on their comments and suggestions.

Reliability

This questionnaire was tried out with ten adolescents with Type 1 diabetes who had characteristics similar to the study sample. Reliability was established by means of internal consistency, and Cronbach's alpha coefficients of the overall DQOLY was 0.95 and that of the three subscales of diabetes life satisfaction, disease impact, and disease-related worries was 0.89, 0.89, and 0.88, respectively. After that, the questionnaire was used with a total of 102 adolescents who participated in the study, and Cronbach's alpha coefficients of the overall DQOLY was 0.89 and that of the three subscales was 0.84, 0.82, and 0.77, respectively.

Psychometric Properties of the Self-Care Behaviors Measure

Validity

Content validity was confirmed by five experts (Appendix C): a pediatric psychologist, a pediatric endocrinologist, two nurse instructors who were experts in nursing theory and development of nursing instruments, and one diabetes nurse specialist. The experts examined the content validity and language appropriateness of the questionnaire, and the researcher revised and improved the questionnaire based on their comments and suggestions.

Reliability

This instrument was tried out with ten adolescents with Type 1 diabetes who had characteristics similar to the sample. Before testing the reliability, the raw scores were converted to Z-scores by calculating, with resulting distribution having a mean of Zero and an SD of 1. It is worth noting here that in general, Z-scores are one type of standard scores. If several distributions are converted to Z-scores, the Z-scores for the various measures can be compared directly. Because calculating Z-scores results in decimals and negative numbers, some researchers prefer to transform them into other distributions. A widely used distribution is one with a mean of 50 and an SD of 10. Such transformed standard scores are called T-scores. To convert Z-scores to T-scores, the following formula is generally employed (Munro, 2001: 67-68):

$$T = 10Z + 50$$

Next, reliability was established by internal consistency, and Cronbach's alpha coefficient of the overall self-care behaviors was .86. After that, this tool was used with a total of 102 subjects in the main study, and Cronbach's alpha coefficient of overall self-care behaviors was .78.

Protection of Human Subjects

The present study was conducted based on the protection of human rights, and the approval to collect data was granted by the Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and

Pramongkutkloa Hospital. Data collection was undertaken with permission of the Committee on Human Rights Related to Research Involving Human Subjects from each research setting (Appendix G). Eligible subjects were individually approached by the researcher and were asked to participate in the study. The researcher explained the purpose of the study, the research processes, benefits, the length of time of the study, and the right to refuse to participate in the study at any time. The subjects who agreed to participate in the study were reassured that the data would be kept strictly confidential and would be presented as group data.

Data Collection Procedures

Data collection was carried out by the researcher after a letter asking for permission was sent from the Faculty of Graduate Studies, Mahidol University, to the deans or directors of Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and Pramongkutkloa Hospital. The researcher collected data between March and July 2005 according to the following schedule:

Ramathibodi Hospital: Mondays and Wednesdays, from 1:00 p.m. to 4:00 p.m.

King Chulalongkorn Memorial Hospital: Fourth Fridays of the month, from 8:00 a.m. to 12:00 p.m.

Siriraj Hospital: Second and fourth Thursdays of the month, from 7:00 a.m. to 12:00 p.m.

Pramongkutkloa Hospital: Mondays, from 9:00 a.m. to 12:00 p.m.

The procedures of data collection were described as follows:

1. The researcher contacted the physician, the head nurse, and staff nurse of the Out-Patient Department of each hospital for their permission and facilitation.
2. The researcher prepared a place for collection of data. It was a private room, away from a bustling scene, so as to enable the diabetic adolescents to concentrate.
3. The subjects who met the inclusion criteria based on a review of their medical records were selected.
4. While the patients were waiting for the physician, the researcher explained the purpose of the study and assured the confidentiality, anonymity, and freedom of

withdrawal from the study at any time to the potential subjects. If the diabetic adolescents and family caregivers agreed to participate in this study, they were asked to sign an informed consent form (Appendix H).

5. The subjects were taken to a private room after being provided with a queue to see the pediatrician. The researcher assured them that they would not miss the appointment to see the pediatrician.

6. The researcher explained the method to answer the questionnaires in the following sequence: 1) demographic characteristics questionnaire, 2) Diabetes Quality of Life for Youth (DQOLY) Questionnaire, and 3) Self-Care Behaviors Questionnaire. It took approximately 30-45 minutes to complete the questionnaires. The subjects were allowed to ask the researcher when they did not understand the questions or wanted to clarify any doubts.

7. Data were collected approximately from two to ten subjects per visit. Collection of data was done one by one, and the subjects were required to participate in data collection only once.

8. After that, the researcher checked whether all items in the questionnaire were completely filled out. If the questionnaires were not completed, the researcher asked the subjects to fill in missing answers.

9. The data were then prepared for analysis by using the computer program data analysis.

Data Analysis

The SPSS for Windows 11.5 was used for data analysis as follows:

1. Frequency, percentage, range, mean, and standard deviation were used to describe the demographic data of adolescents with diabetes (gender, duration of diabetes, family income, and metabolic control).

2. Scores of each aspect of adolescents' self-care behaviors and quality of life of adolescents with Type 1 diabetes were analyzed by using range, mean, and standard deviation.

3. Multiple Regression Analysis was used to test the assumptions of the research (Appendix M).

It is noteworthy that before multiple regression analysis was performed, five assumptions related to multiple regression analysis including normal distribution, linearity, homoscedasticity, autocorrelation, and multicollinearity were examined. There was no violation of the assumptions for multiple regression. Therefore, the data were appropriate for conducting multiple regression analysis.

4. The relationship between self-care behaviors, gender, duration of disease, family income, and metabolic control and quality of life of adolescents with Type 1 diabetes were analyzed by means of Pearson's product-moment correlation coefficients. The following criteria for categories of correlation coefficient levels (Munro, 2001: 234) were utilized:

± 0.00 - ± 0.25	little
± 0.26 - ± 0.49	low
± 0.50 - ± 0.69	moderate
± 0.70 - ± 0.89	high
± 0.90 - ± 1.00	very high

5. Hierarchical and Stepwise Multiple Regression Analysis were used to identify the predictive power of self-care behaviors, gender, duration of diabetes, family income, and metabolic control on quality of life of adolescents with Type 1 diabetes.

6. The significance level of alpha was set at 0.05.

CHAPTER IV

RESULTS

This predictive correlational study was conducted to determine the influence of basic conditioning factors including gender, duration of diabetes, family income, metabolic control (recent HbA1c), and self-care behaviors on quality of life of adolescents with Type1 diabetes at the Endocrinology Clinic, Out-Patient Department, Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and Pramongkutkloa Hospital. A total of 102 subjects were recruited based on the inclusion criteria during the period of data collection from March to July 2005. In this chapter, the study findings are presented in tables with descriptions as follows:

Part I: Findings regarding demographic and clinical characteristics of diabetic adolescent subjects and demographic characteristics of caregivers are shown in Tables 1-3.

Part II: Self-Care Behaviors and Diabetes Quality of Life for Youth (DQOLY) scores are illustrated in Tables 4-9.

Part III: The relationships between each of the independent variables and the dependent variable are presented in Table 10.

Part IV: The predictors of overall DQOLY are depicted in Table 11.

Part I: Demographic and clinical characteristics of diabetic adolescents and demographic characteristics of caregivers

Table 1 Frequency, percentage, range, mean and standard deviation of demographic characteristics of the subjects (n =102)

Characteristics	Frequency	Percentage
Setting (Hospital)		
Pramongkutkloa	3	2.9
King Chulalongkorn Memorial	15	14.7
Ramathibodi	22	21.6
Siriraj	62	60.8
Age (Years)		
12 – 14	52	51.0
15 – 16	26	25.5
17 – 18	24	23.5
Mean = 14.7; S.D. = 1.9; Min = 12; Max = 18		
Gender		
Male	37	36.3
Female	65	63.7
Level of education		
Primary education	16	15.7
Secondary education	76	74.5
Diploma/Certificate	3	2.9
Undergraduate	7	6.9
Mean = 9.01; S.D. = 2.23; Min = 6; Max = 14		
Family income (baht/month)		
< 5,000	4	3.9
5,001 – 10,000	15	14.7
10,001 – 15,000	24	23.5
15,001 – 20,000	39	38.2
20,001 – 50,000	16	15.7
> 50,001	4	3.9
Median = 27,500; Mode = 50,000; Mean = 38,020; S.D. = 32,028.14; Min = 3,000; Max = 150,000		

Table 1 Frequency, percentage, range, mean and standard deviation of demographic characteristics of the subjects (n =102) (continued)

Characteristics	Frequency	Percentage
Sufficiency of income		
Inadequate or indebted	14	13.8
Adequate with no savings	51	50.0
Adequate with savings	37	36.3
Method of payment of medical expenses		
Self-paid	36	35.3
Government welfare	34	33.3
30-Baht healthcare card	29	28.4
Social security	3	3.0
Sources of information about diabetic care		
Multidisciplinary team	82	80.4
Diabetes camp	59	57.8
Mass media (TV/Internet)	55	53.9
Only one healthcare provider (Physician/Nurse/Dietitian)	19	18.6
DM peers	15	14.7
Booklet	13	12.7
Previous participation in the diabetes camp		
No	41	40.2
Yes	61	59.8
1 time	33	54.1
2 times	17	27.9
3 times	10	16.4
4 times	1	1.6

Baseline demographic characteristics of the subjects are presented in Table1. A total of 102 adolescents with Type 1 diabetes were recruited from four tertiary medical centers including the Faculty of Medicine of Ramathibodi Hospital (n = 22), King Chulalongkorn Memorial Hospital (n = 15), Faculty of Medicine of Siriraj Hospital (n = 62), and Pramongkutkloa Hospital (n = 3). As regards age, the subjects ranged between 12 and 18 years old, with the mean age of 14.7 years (S.D. = 1.9). Of these, slightly more than half, or 51%, were early adolescents (12-14 years), 25.5% were middle adolescents (15-16 years), and 23.5% were late adolescents (17-18 years). More than half of them (63.7%) were female, while 36.3% were male. In addition, approximately three-quarters, or 74.5%, completed secondary education, with the average years of education equal to 9.01 (S.D. = 2.23; range = 6-14). Moreover, the largest group, or 38.2%, had average monthly family income between 15,001 and 20,000 baht (Median = 27,500; Mean = 38,020; S.D. = 2.23; range = 3,000-150,000). With regard to sufficiency of income, half of them had sufficient income but did not have enough for savings. Besides, 35.3% paid for their medical expenses by themselves. In terms of sources of information about diabetes care, most of the subjects, or 80.4%, received the information from the multidisciplinary team, whereas only 12.7% received information from booklets. Finally, approximately 60% of the subjects had ever attended the diabetes camp, while 40.2% had never done that. Regarding frequency of attendance, more than half (54.1%) attended the camp only once, followed by twice (27.9%), three times (16.4%), and at least four times (1.6%).

Table 2 Frequency, percentage, range, mean, and standard deviation of clinical characteristics of the subjects (n = 102)

Characteristics	Frequency	Percentage	Characteristics
Insulin therapy regimen			Age of onset (years)
Conventional (one or two insulin injections/day)	71	69.6	Mean = 9.6; S.D. = 3.4
Intensive (three or more insulin injections/day)	31	30.4	Min = 0.3; Max = 15.8
Total daily insulin dosage (units/kg/day)			Duration of diabetes (months)
0.5-1.0	59	57.8	Mean = 61.9; S.D. = 41.4
1.1-1.5	37	36.3	Min = 12; Max = 216
> 1.5	6	5.9	
Mean = 1.03; S.D. = 0.28	Min = 0.5	Max = 1.9	
Self-administration of insulin injection			
Never	2	2.0	
Sometimes	26	25.5	
Always	74	72.5	
Self-monitoring of blood glucose (times/day)			
0	3	3.0	
1	31	30.4	
2	39	38.2	
3	18	17.6	
≥4	11	10.8	
Eating snacks (times/day)			
No	12	11.8	
Yes	90	88.2	
1 time	38	42.2	
2 times	35	38.9	
3 times	17	18.9	

Table 2 Frequency, percentage, range, mean, and standard deviation of clinical characteristics of the subjects (n = 102) (continued)

Characteristics	Frequency	Percentage
Hypoglycemia events in the past three months		
No	12	11.8
Yes	90	88.2
1-4 episodes/week	59	65.6
1 episode/month	22	24.4
1 episode/2-3months	9	10.0
Recent HbA1c (%)		
< 7 (good)	9	8.8
7-8 (fair)	18	17.7
> 8 (poor)	75	73.5
Mean = 9.2; S.D. = 1.7; Min = 5.7; Max = 13.7		
Weight for height: Females		
Obesity (> p97)	10	15.4
Non-obesity (< p97)	55	84.6
Weight for height: Males		
Obesity (> p97)	6	16.2
Non-obesity (< p97)	31	83.8

Diabetes related clinical characteristics are presented in Table 2. The mean age of the onset of diabetes was 9.6 years (S.D. = 3.4; Range = 0.3-15.8), and the mean duration of diabetes was 61.9 months (S.D. = 41.4; Range = 12-216). In addition, more than two-thirds of the subjects (69.6%) used conventional insulin treatment of two injections per day, whereas 30.4% used intensive insulin treatment of three to four injections per day. The average total insulin dosage was 1.03 unit/kg/day (S.D. = 0.28; Range = 0.5-1.9). Only 5.9% of the subjects needed insulin dosage more

than 1.5 units/kg/day. In terms of diabetes self-care, close to three-quarters (72.5%) could perform self-injection all the times, and approximately 38% monitored blood glucose two times per day, while only 3% did not monitor blood glucose. In addition, most of them (88.2%) had snacks. In this group of snacking subjects, 42.2% had one snack, 38.9% had two snacks, and only 18.9% had three snacks in one day. Moreover, the same percentage, or 88.2%, had experienced hypoglycemia in the previous three months. Of these, 65.6% had hypoglycemia one to four episodes pre week, about a quarter, or 24.4%, had one episode pre month, and 10% had one episode every two to three months. Regarding clinical outcomes, recent HbA1c in these group varied from 5.7% to 13.7%, with the mean recent HbA1c of 9.2% (S.D. = 1.7; Range = 5.7-13.7). One interesting finding was that nearly three-quarters (73.5%) had poor metabolic control level as reflected by recent HbA1c > 8%, whereas only a few (8.8%) had good metabolic control. With regard to weight for height, 15.4% and 16.2% of the female and male subjects were clinically obese, respectively.

Table 3 Frequency, percentage, range, mean, and standard deviation of demographic characteristics of caregivers (n = 102)

Characteristics	Frequency	Percentage
Type of caregivers		
Single parent	8	7.8
Two parents	86	84.4
Others	8	7.8
Marital Status		
Single	5	4.9
Married	88	86.3
Widowed/Divorced	9	8.8
Level of education		
No formal education	1	1.0
Primary education	26	25.5
Secondary education	17	16.7
College diploma	18	17.6
Bachelor's degree	34	33.3
Graduate degree or higher	6	5.9
Occupation		
Unemployed	19	18.6
Employed	24	23.5
Business owners or traders	28	27.5
Government officials or public enterprise employees	31	30.4

Demographic characteristics of caregivers are presented in Table 3. Most of the subjects, or 84.3%, lived with their two parents, and most of the caregivers, or 86.3%, were married. As regards educational background, a third, or 33.3% of them, completed a bachelor's degree. In terms of employment, the largest group of caregiver subjects, or 30.4%, were government officials or public enterprise employees, and only 18.7% were unemployed.

Part II: Self-care behaviors and Diabetes Quality of Life for Youth scores

Table 4 Range, mean, standard deviation, and percentage of mean of self-care behaviors of the diabetic subjects (n = 102)

Self-care behaviors	Possible range	Actual range	Mean	S.D.	% of Mean
Personal hygiene care	0-21	0-21	15.3	4.6	76.5
Dietary control	0-47	9-42	25.7	6.5	54.7
Medication intake	0-34	9-34	23.9	5.7	70.3
Physical activity	0-19	1-17	9.4	3.9	49.8
Self-monitoring	0-22	3-15	8.5	2.8	38.6
Problem solving	0-46	7-45	24.3	7.4	52.8
Stress management	0-15	4-15	9.0	2.8	60.0
Reduction of risks of diabetes complications	0-20	5-20	12.0	4.0	60.0
Overall self-care behaviors	0-224	52-180	128.0	25.1	57.1

An analysis of mean, standard deviation, and score range for overall self-care behaviors revealed that the mean raw score of overall self-care behaviors was 128.0 (S.D. = 25.1), or 57.1%. When the mean raw score of overall self-care behaviors was compared with the highest possible score of 224, the result indicated that overall self-care behaviors were at a low level.

As for each subscale, the subscale with the highest mean raw score was personal hygiene care (M = 15.3; S.D. = 4.6), or 76.5%, which was at a moderate level. On the other hand, the subscale with the lowest mean raw score was self-monitoring (M = 8.5; S.D. = 2.8), or 38.6%, which was at a low level, as illustrated in Table 4.

See Appendix I for the score of each of the items in the self-care behavior subscale.

Table 5 Range, mean, and standard deviation of Diabetes Quality of Life for Youth scores (DQOLY) (n = 102)

Quality of life	Possible Range	Actual Range	Mean	S.D.	Transform score		
					Range	Mean	S.D.
Satisfaction	17 – 85	40-82	61.6	8.2	33.8 – 95.6	65.6	12.1
Impact	23-115	59-109	87.8	10.6	39.1 – 93.5	70.5	11.5
Worry	11- 55	28-55	45.6	6.2	38.6-100.0	78.6	14.0
Overall DQOLY	51-255	116-229	191.1	19.9	36.8 – 87.3	68.7	9.8

An analysis of mean, standard deviation, and raw score range for overall DQOLY and the satisfaction, impact, and worry subscales revealed that the mean raw score of overall DQOLY was 191.1, while the mean score of each subscale was 61.6, 87.8, and 45.6, respectively.

The raw score of DQOLY was reversed scored with the exception of satisfaction items, so positive quality of life was equivalent to a higher score. Then, reversed scores were transformed into a 100-point scale where 0 representing the lowest possible quality of life (less satisfaction, more impact, and more worry), and 100 representing the highest possible quality of life (more satisfaction, less impact, and less worry). The mean of the transformed overall DQOLY score was 68.7, and that of each of the subscales of satisfaction, impact, and worry was 65.6, 70.5, and 78.6, respectively.

When the mean score was compared with the maximum possible score, the result indicated that overall DQOLY and each of the subscales were at a moderate level, as illustrated in Table 5.

Table 6 Range, mean, standard deviation, and percentage of mean of satisfaction scores of the three highest and lowest items (n = 102)

Satisfaction	Possible range	Actual range	Mean	S.D.	% of mean
Highest items					
9. How satisfied are you with your friendships?	1-5	2-5	4.32	.692	86.4
4. How satisfied are you with your current medical treatment?	1-5	3-5	4.10	.637	82.0
16. How satisfied are you with how your classmates treat you?	1-5	1-5	3.88	.888	77.6
Lowest items					
17. How satisfied are you with your attendance at school?	1-5	1-5	2.85	1.057	57.0
6. How satisfied are you with the burden your diabetes is placing on your family?	1-5	1-5	3.20	1.015	64.0
5. How satisfied are you with the flexibility you have with your diet?	1-5	1-5	3.29	.950	65.8

As shown in Table 6, the three items with the highest scores of satisfaction, which reflected more satisfaction on DQOLY, were as follows: item 9: How satisfied are you with your friendships? (86.4%), item 4: How satisfied are you with your current medical treatment? (82.0%), and item 16: How satisfied are you with how your classmates treat you? (77.6%), respectively.

The three items with the lowest scores of satisfaction, which reflected less satisfaction on DQOLY, were as follows: item 17: How satisfied are you with your attendance at school? (57.0%), item 6: How satisfied are you with the burden your diabetes is placing on your family? (64.0%), and item 5: How satisfied are you with the flexibility you have with your diet? (65.8%), respectively.

See Appendix J for the score of each of the items in the satisfaction subscale of DQOLY.

Table 7 Range, mean, standard deviation, and percentage of mean of impact scores of the three highest and lowest items (n = 102)

Impact	Possible range	Actual range	Mean	S.D.	% of mean
Highest items					
9. How often does your diabetes keep you from riding a bicycle or a motorcycle ?	1-5	1-5	4.50	.876	90.0
10. How often does your diabetes interfere with your exercises?	1-5	2-5	4.35	.919	87.0
18. How often do you find that your diabetes prevents you from participating in school activities (e.g., school plays, sports, etc.)	1-5	1-5	4.30	1.003	86.0
Lowest items					
8. How often do you feel restricted by your diet?	1-5	1-5	2.78	1.166	55.6
12. How often do you find yourself explaining what it means to have diabetes?	1-5	1-5	3.15	.959	63.0
22. How often do you find that your parents act like diabetes is their disease, not yours?	1-5	1-5	3.28	1.146	65.6

According to Table 7, the three items with the highest scores of impact, which reflected less impact on DQOLY, were as follows: item 9: How often does your diabetes keep you from riding a bicycle or motorcycle? (90%), item 10: How often does your diabetes interfere with your exercises? (87%), and item 18: How often do you find that your diabetes prevents you from participating in school activities (e.g., school plays, sports, etc.) (86%).

On the other hand, the three items with the lowest scores of impact, which reflected more impact on DQOLY, were as follows: item 8: How often do you feel restricted by your diet? (55.6%), item 12: How often do you find yourself explaining what it means to have diabetes? (63.0%), and item 22: How often do you find that your parents act like diabetes is their disease, not yours? (65.6%).

As to each item score of impact subscale on DQOLY see in Appendix K.

Table 8 Range, mean, standard deviation, and percentage of mean of worry scores of the three highest and lowest items (n = 102)

worries	Possible range	Actual range	Mean	S.D.	% of mean
Highest items					
1. How often do you worry about whether you will get married?	1-5	1-5	4.53	.841	90.6
8. How often do you worry whether someone will not go out with you because you have diabetes?	1-5	1-5	4.47	.972	89.4
2. How often do you worry about whether you will have children?	1-5	1-5	4.43	.928	88.6
Lowest items					
7. How often do you worry that you will get complications from your diabetes?	1-5	1-5	2.94	1.051	58.8
3. How often do you worry about whether you will not get a job you want?	1-5	1-5	3.95	1.138	79.0
4. How often do you worry about whether you will pass out?	1-5	1-5	4.09	1.025	81.8

Table 8 showed that the three highest items rating scores of worry subscale, which reflected less worry on DQOLY as follows: item 1; How often do you worry about whether you will get married? (90.6%), followed by item 8; How often do you worry whether someone will not go out with you because you have diabetes? (89.4%), and item 2; How often do you worry about whether you will have children? (88.6%).

The three lowest items rating scores, which reflected more worry on DQOLY were item 7; How often do you worry that you will get complications from your diabetes? (58.8%), followed by item 3; How often do you worry about whether you will not get a job you want? (79.0%), and item 4; How often do you worry about whether you will pass out? (81.8%).

See Appendix L for the score of each of the items in the impact subscale of DQOLY.

Table 9 Frequency and percentage of self-rated health (n=102)

self-rated health	Frequency	Percentage
poor	3	2.9
Fair	45	44.1
good	52	51.0
excellent	2	2.0

DQOLY also included a single item of self-rated health. As regards the score of self-rated health, it showed that more than half of the subjects, or 51%, perceived that they had good health. This was followed by nearly half, or 44.1%, who perceived that their health was fair. Only a few, or 2.9%, perceived that they had poor health. It is worth noting here that a mere 2% perceived that they were in excellent health, as depicted in Table 9.

Part III: The relationships between each of the independent variables and the dependent variable

Table 10: Pearson's product moment correlation coefficient between gender, family income, duration of diabetes, recent HbA1c, and self-care behaviors and overall DQOLY (n = 102)

Variables	1	2	3	4	5	6
1. Gender	1.000					
2. Family income	-.132	1.000				
3. Duration of diabetes	.034	.180	1.000			
4. Recent HbA1c	-0.97	-.181	.189	1.000		
5. Self-care behaviors	-.139	.213*	-.007	-.249*	1.000	
6. Overall DQOLY	.057	-.127	-.157	-.202*	.385**	1.000

* $p < .05$, ** $p < .01$

Remarks: Variable Value of Gender: male = 1; female = 0

As regards the correlation between each of the independent variables and the dependent variable, the findings showed that recent HbA1c was negatively correlated with overall DQOLY at a rather low level ($r = -.202$, $p < .05$). On the other hand, overall self-care behaviors were positively correlated with overall DQOLY at a low level ($r = .385$, $p < .01$). However, gender, family income, and duration of diabetes were not correlated with overall DQOLY ($r = .057$, $p > .05$; $r = -.127$, $p > .05$; $r = -.157$, $p > .05$, respectively).

Besides, in terms of intercorrelations among the independent variables, it could be seen that family income was positively correlated with overall self-care behaviors at a rather low level ($r = .213$, $p < .05$). On the other hand, recent HbA1c was negatively correlated with overall self-care behaviors at a rather low level ($r = -.249$, $p < .05$). Last but not least, it is noteworthy that no intercorrelation among other independent variables was found, as depicted in Table 10.

Part IV: The predictors of overall DQOLY**Table 11: Hierarchical and Stepwise Multiple Regression Analysis of Independent Variables on Overall DQOLY (n = 102)**

Step	Predictors	b	SEB	Beta	F	R ²	R ² change	t
1	Recent HbA1c	-1.331	1.117	-.113	4.266	.041	.041	-1.192
2	Overall Self-care behavior	.283	.075	.357	9.465	.161	.120	3.756***

Constant (a) = 167.035; Overall F(2,99) = 9.465, *** p < .001

When testing the assumptions for multiple regression of normality, linearity, homoscedasticity, autocorrelations, and multicollinearity, no violation was found.

Therefore, hierarchical and stepwise multiple regression analyses were conducted to examine the factors influencing quality of life of adolescents with Type 1 diabetes. The independent variables were entered in two blocks. The block of basic conditioning factors variables consisting of gender (male = 1; female = 0), family income, duration of diabetes, and recent HbA1c were entered first in order to control for their effects before the overall self-care behavior variable was entered. Then, the second block of overall self-care behavior variable was entered. The variables within the blocks were entered by the stepwise method.

The results of hierarchical and stepwise multiple regression analyses indicated that, in step 1, recent HbA1c in the first block of basic conditioning factors was entered into the equation, and it could predict overall DQOLY by 4.1% ($F_{(1,100)} = 4.266$, $p < .05$). None of the demographic variables that failed to enter the model showed significant correlation with overall DQOLY.

In step 2, overall self-care behavior variable in the second block of variable was entered into the equation, and it could predict overall DQOLY by another 12.0% ($F_{(1,99)} = 14.106$, $p < .001$). Therefore, the final step of the regression model showed that overall self-care behavior and recent HbA1c could co-predict overall DQOLY by 16.1% ($F_{(2,99)} = 9.465$, $p < .001$). Based on the selected variables, overall self-care behavior was the strongest predictor of overall quality of life of adolescent with Type 1 diabetes (Beta = .357, $p < .001$), followed by recent HbA1c (Beta = -.113, ns.), as illustrated in Table 11.

CHAPTER V

DISCUSSION

This predictive correlational study was conducted to determine the factors influencing quality of life of adolescents with Type 1 diabetes using Orem's Self-Care Model (Orem, 1995) as the conceptual framework of the study. In this study, a hypothesis stating that basic conditioning factors including gender, duration of diabetes, family income, recent HbA1c, and self-care behaviors could co-predict quality of life of adolescents with Type 1 diabetes. This chapter presents the discussion of the findings of the study.

Demographic Characteristics of the Subjects

In this study, a total of 102 adolescents with Type 1 diabetes were recruited as the study sample. They ranged in age from 12 to 18 years old, with a mean age of 14.7 years (SD = 1.9). The majority of the subjects were female and in their early adolescence. The age of subjects were nearly similar to the age of those in other studies conducted with adolescents with Type 1 diabetes, as it was the age group most often affected by diabetes (Grey, Boland, Yu, Sullivan-Bolyai, & Tamborlane, 1998: 909; Guttmann-Bauman, Flaherty, Strugger, & McEvoy, 1998: 915; Faro, 1999: 247; Hoey et al., 2001: 1924; Graue, Wentzel-Larsen, Hanestad, Batsvik, & Sovik, 2003: 1191).

In addition, approximately three-quarters of the subjects (74.5%) completed secondary education, with the average number of years of education of 9.01 (S.D. = 2.23), reflecting that the subjects were in the school grade appropriate to age. Education is an important means of individuals to obtain necessary and beneficial information and learn about diabetic care for good decision-making process of their care and to take control of their lives (Doh, 2002 cited by King, 2003: 1208). These findings were similar to those reported by the study of Banchang Sukcharearn et al. (B.E.2545: 83) that more than half of the diabetic subjects (45%) finished high school.

Regarding family monthly income, the family income ranged from 3,000 to 150,000 Baht per month, with a mean of 38,020 Baht (Median = 27,500; S.D. = 2.23). The largest group (38.2%) had family monthly income between 15,001 and 20,000 Baht. When considering financial status of the subjects, it was found that the income of the largest group of subjects was higher than the average family income of 12,150 Baht/month reported by National Statistical Office (2000), but it was lower than the average family monthly income in the study of Banchang Sukcharearn et al. (B.E. 2545: 83), in which one-third of the subjects (33.8%) had family income between 20,001 and 50,000 Baht per month. However, it could be concluded that the family monthly income of the subjects in the present study was rather moderate to high. Moreover, half of subjects (50%) had adequate income, with over one-third (36%) also having enough for savings (see Table 1). As for payment of medical expenses, 35.3% of the subjects had no financial support and their treatment fees could not be reimbursed, so they had to pay for medical expenses by themselves. However, it is worth noting here that close to two-thirds of the subjects, or 64.7%, received some kinds of financial support. One-third, or 33.3%, relied on reimbursement for government officials, more than one-fourth, or 28.4%, used the 30-Baht healthcare card, and a mere 3% had social security. Generally, a good economic status and financial support can be a resource for self-care management including acquiring necessary equipment, or seeking support or services to facilitate self-care; therefore, the feeling of burden is reduced (Archbold, 1983; Schwarz & Roberts, 2000 cited by Wanna Meesuk, 2005).

Finally, in terms of sources of information about diabetes self-care, most (80.4%) received diabetes self-care information from the multidisciplinary team, while 2.7% obtained information from booklets. Indeed, the multidisciplinary care is essential for an effective diabetes care. The DCCT can demonstrate that achievement of the desired level of glucose control demands high motivation on the part of patients and the family and extraordinary support from a multidisciplinary team (DCCT Research Group, 1994, cited by Faro, 1999). Besides, according to the findings of the present study, approximately 60% of the subjects had attended the Diabetes Camp. Metabolic control is often worsened in adolescence, and all subjects in this study received diabetes care in tertiary medical centers which organize Summer Diabetes

Camp for them every two years. Thus, they were encouraged to attend the Diabetes Camp to develop self-management skills, gain knowledge to improve metabolic control, and consequently improve quality of life.

Clinical Characteristic of the Subjects

When considering the age of the onset of diabetes, it was discovered that the mean age of the onset was 9.6 years (S.D. = 3.4). This finding is similar to epidemiological data reporting that the most common age of the onset of Type 1 diabetes is between 10 and 14 years of age (Karvonen et al., 2000 cited by Faulkner, 2003: 362). However, the younger the age when diabetes is first diagnosed, the longer the adolescents have to live with diabetes. In the present study, the mean duration of diabetes was 61.9 months (S.D. = 41.4).

Regarding insulin regimen, most of the subjects (69.6%) used conventional insulin treatment with two injections per day, while 30.4% with intensive insulin treatment had injections three to four times per day. According to the findings of the present study, the subjects used conventional insulin treatment more than intensive insulin treatment. The Diabetes Control and Complications Trial (DCCT) recommended for all adolescents with Type 1 diabetes over the age of 13 years achieve metabolic control and reduce the incidence and progression of microvascular and neuropathic complications through the intensive therapy (Grey, et al., 2001: 377). In Thailand, intensive therapy has been proved unsuccessful to promote all Thai adolescents with Type 1 diabetes because intensive regimen management is seen as complex and demanding involving extensive education, multiple daily injections (MDI), frequent blood glucose monitoring, and greater needs for adjusting food intake (O'Neil, Jonnalagadda, Hopkins, & Kicklighter, 2005: 85).

According to the study findings, the average daily insulin dosage was 1.03 units/kg/day (S.D. = 0.28). This may be because daily insulin dosage depends on many factors such as age, weight, stage of puberty, duration and phase of diabetes, nutrition intake and distribution, and daily routine (ISPAD Guidelines, 2000: 50). During puberty, adolescence children can become insulin resistant because of increasing levels of growth hormone and sex steroids. Thus, insulin requirements usually rise to about 1.5-2.0 units per kilogram per day, falling to about 1 unit per

kilogram per day thereafter (Belchetz & Hammond, 2000: 142). This finding was rather similar to that reported in the study of Faulker (2003), suggesting that the mean insulin dosage of adolescents with diabetes is 0.98 (S.D. = 0.25).

In terms of diabetes self-care, close to three-quarters (72.5%) always performed insulin injections by themselves. One possible explanation of this finding is that adolescence is the time individuals learn about diabetes self-care and manage their own diabetes (Hampson et al., 2003: 142) such as to inject insulin by themselves and measure their own blood glucose at an appropriate age. However, as individuals vary greatly in their maturity, acquisition of skills and peer pressure at diabetes camps can help. Nevertheless, parents need to remain competent in and confident of their injection skills in case of emergencies (Turtle, Kaneo, & Osato, 1999: 490).

Regarding self-monitoring of blood glucose, more than one-third of the subjects (38%) monitored their blood glucose two times daily, while only 3% did not monitor blood glucose. Furthermore, almost all subjects (97%) had home self-monitoring of blood glucose (SMBG), but only 10.8% monitored blood glucose as suggested; that is, at least four times daily. Self-monitoring of blood glucose at least four times a day is recommended especially for Type 1 diabetes, at various times throughout the day, and when symptoms are presented (Boland & Grey, 2000: 430). It is useful to identify asymptomatic hypoglycemia, determine patterns in insulin action, and adjust insulin dosage, food intake, and activity level to maintain glycemia within the individualized target range (Kaufman, Gibson, Halvorson, Carpenter, Fiasher, & Pitukcheewanont, 2001: 2030). Only few subjects, or 3%, did not monitor blood glucose because of their financial problems.

In addition, most of the subjects (88.2%) had snacks, but only 18.9% had three snacks in one day. This finding may help explain by most of the subjects, or 88.2%, had experienced hypoglycemia in the previous three months. All of individuals with Type 1 diabetes should received advice on their dietary management in consistency with daily intake of regular meals and snacks (Boland & Grey, 2000: 433). Because insulin was released continuously from the injection site, hypoglycemia may occur if snacks are not eaten between the main meals (Wolfsdorf, Anderson, & Pasquarello, 1994: 535).

Regarding clinical outcomes, the assessment by weight for height of the subjects showed that 15.4% of female subjects were obese and 16.2% of male subjects suffered from obesity. In general, obesity can occur in adolescents with Type 1 diabetes, especially those on intensive regimen (Boland & Grey, 2000: 433). On the other hand, growth and sexual development may be slow, if adolescents had poor control of diabetes. Thus, at each visit, accurate measurement of height and weight should be assessed and recorded.

In terms of metabolic control, recent HbA_{1c} in this group of subjects varied from 5.7% to 13.7%, with the mean recent HbA_{1c} of 9.2% (S.D. = 1.7). Based on international criteria, an HbA_{1c} level of > 8 is used to define adolescents with Type 1 diabetes with poor metabolic control in the present study. One interesting finding was that nearly three-quarters (73.5%) of the subjects had poor metabolic control, whereas only 8.8% had good metabolic control. A previous study (Kovav, Goldston, Obrosky, & Lyengar, cited by Frey, Ellis, Naar-King, & Greger, 2004) also reported that approximately 25% to 30% of adolescents with Type 1 diabetes experienced persistent poor metabolic control. When comparing the findings of Kovav et al. with those revealed in the present study, it could be concluded that adolescents in the previous study had better metabolic control than did the subjects in the present study. In general, many factors may contribute to poor metabolic control in adolescents with Type 1 diabetes such as fluctuations in blood glucose level, activity patterns, and food intake which can be erratic and unpredictable (Kaufman et al., 2001: 2030). Another explanation may be due to the physiological and psychological changes of puberty (Belchetz & Hammond, 2000: 142). The effects of these pubertal changes take place within a larger developmental context of multiple psychological transitions in emotional, cognitive, familial, and social domains. Another factor is that adolescents with diabetes have several developmental tasks, and at the same time they have to perform complex diabetes self-care tasks. Consequently, self-care behaviors are declined (Songer, LaPorte, Lave, Dorman, & Becker, 1997: 577). Thus, all of these factors may have an effect on diabetes management and metabolic control of adolescent in many ways.

Caregiver characteristics

Regarding the family structure, it could be seen that most subjects (84.3%) lived with two parents. Adolescents with poor metabolic control are more likely to be from a single-parent family than a two-parent family (Frey et al., 2004: 648). This may imply that having two parents makes diabetic adolescents have more helpful resources. Even though most adolescents take more responsibility for self-care tasks over time, they still need encouragement and support from their parents in their daily diabetic care from time to time (DeSouza & Nairy, 2003: 71). A similar findings was reported by Frey et al. (2004: 648) that adolescents with poor metabolic control are more likely to be from a single-parent family than a two-parent family. Likewise, the study of Graue, Wentzel-Larsen, Hanestad, Batsvik, & Sovik (2003) revealed that 79.1% of the subjects lived with two parents. Furthermore, most parents had a moderate to high education level and were employed.

Diabetes Quality of Life for Youth (DQOLY)

According to the study findings, the mean raw score of overall DQOLY was 191.1 (S.D. = 8.2). The mean raw scores of three subscales of satisfaction, impact, and worry were 61.6 (S.D. = 12.1), 87.8 (S.D. = 10.6), and 45.6 (S.D. = 6.2), respectively. The mean raw scores of overall DQOLY and three subscales of satisfaction, impact, and worry were at a moderate level (See Table 5). In addition, more than half of the subjects (51%) perceived their physical health status as good, and only 2.9% perceived their health as poor (See Table 9). This means that the subjects perceived their overall quality of life at a moderate level and perceived their physical health status at a good level. In other words, they had good physiological quality of life than psychosocial quality of life. In fact, disease process and treatment regimen can cause disruption of usual activities and affect overall quality of life (O'Neil, Jonnalagadda, Hopkins, & Kicklighter, 2005: 86). When considering the physiological aspect, this finding was consistent with the studies by Faulkner (2003) and Graue et al. (2003) which found that diabetic adolescents perceived their physical health status as good, but when comparing their health status with that of their healthy peers, they felt that the level of physical health was lower. This may be because those

who feel that diabetes is no threat to their physiological quality of life will perceive good health status (Kyngas, 2000: 265). Furthermore, as regards the psychosocial aspect, the finding of the present study was inconsistent with the study of O'Neil, Jonnalagadda, Hopkins, & Kicklighter (2005) that persons with Type 1 diabetes aged 9 to 17 years had good quality of life. Also, Grey, Boland, Yu, Sullivan, & Tamborlane (1998) found that adolescents with diabetes perceived their quality of life as good, with high satisfaction with life, moderate impact of diabetes, and low worries about diabetes.

When considering each aspect of DQOLY, it was found that the subjects of the present study had mean raw score of 61.6 (S.D. = 8.2) and mean transformed score of 65.6 (S.D. = 12.1) of the satisfaction subscale at a moderate level. The three items with the highest rating scores of the satisfaction subscale, which reflected more satisfaction on DQOLY, were as follows: item 9: How satisfied are you with your friendships? (86.4%), item 4: How satisfied are you with your current medical treatment? (82.0%), and item 16: How satisfied are you with how your classmates treat you? (77.6%). Although adolescents with diabetes indicated their life satisfaction to be lower than that of their peers, they were learning to live with diabetes for the rest of their life. The greatest satisfaction reflected that the subjects felt that living with diabetes did not make them different from their peers and they received good friendship and medical services. One plausible explanation is that adolescents with diabetes should have the same social rights as their non-diabetic peers, and no stigma nor discrimination should be attached to diabetic persons (ISPAD Consensus Guidelines, 2000: 79). Adolescents spend a considerable amount of time with peer at school; thus, the strong peer relationships are fundamental for the development of social skills, as well as a healthy self-concept and future emotional adjustment (Auria et al., 2000: 175). They are also mostly secure as they receive maximal support from friends and healthcare providers, and they are very highly motivated to follow the prescribed treatment (Jacobson et al., 1987: 810). This is congruent with the study of Bearman & La Greca (2002) that social support from friends may be an important source of emotional support and may facilitate adolescents' adjustment to chronic disease and ability to cope with a difficult treatment.

On the other hand, the three items with the lowest rating scores, which reflected less satisfaction, were as follows: item 17: How satisfied are you with your attendance at school? (57%), item 6: How satisfied are you with the burden your diabetes is placing on your family? (64%), and item 5: How satisfied are you with the flexibility you have with your diet? (65.8%) (see Table 6). Less satisfaction means that they were unhappy or had problems at school. This may be because school is a primary setting in which adolescents learn not only academic skills, but social skills for everyday living. At school, adolescents experience success and failure and learn how to fit in with others (Sroufe et al., 1996 cited by Auria, Christian, Henderson, & Haynes, 2000: 178). Most of the subjects in this study (73.5%) had poor metabolic control. Adolescents with diabetes who had poor control may have to endure frequent appointments with the physician or re-hospitalization due to their inability to attend school on a regular basis. Also, excessive school absence, depression, and social isolation were frequent problems in this group (Orr, Golden, Myers, & Marrero, 1983: 170), so they perceived more diabetes burden and less satisfaction with attendance in school (Palmer, 2001, cited by Sullivan-Bolyai, Deatrick, Gruppuso, Tamborlane, & Grey, 2003: 23).

With regard to family burden related to diabetes, the financial burden resulting from cost of health care, particularly in low-income families, could be a barrier to the appropriate use of health services, including acquisition of blood glucose testing strips, insulin, and syringes (Songer, Laporte, Lave, Dorman, & Becker, 1997: 583). As a consequence, they perceived more family burdens which were related to diabetes.

In terms of dietary restriction, adolescents with diabetes often face with restriction in amount, types, and timing of food consumption (e.g., having meals at certain times, waiting for insulin effect before eating meals and between-meal snacks, etc.). These restrictions may negatively affect perceptions of quality of life by increasing the level of perceived diabetes-related burdens (Watkin, Connell, Fitzgerald, Klem, Hickey, & Ingersoll-Dayton, 2000: 1514). For this reason, adolescents reflected that they need to perform dietary self-care within flexibility in lifestyle.

Secondly, as for the impact subscale, the mean raw score was 87.8 (S.D. = 10.6) and the mean transformed score was 70.5 (S.D. = 11.5); thus, they were at a moderate level. The three items with the highest rating scores of the impact subscale, which reflected less impact on DQOLY, were as follows: item 9: How often does your diabetes keep you from riding a bicycle or a motorcycle? (90%), item 10: How often does your diabetes interfere with your exercises? (87%), and item 18: How often do you find that your diabetes prevents you from participating in school activities (e.g., school plays, sports, etc.) (86%) (see Table 7). Less impact indicated that diabetes disrupted their social activities such as riding, exercising, and participating in school activities (plays/sports) at a moderate level. This may be because the subjects were still able to take part in these activities just like their healthy peers. Such finding yielded support to the recommendation of ISPAD (2000) that children and adolescents should have the same social rights as their non-diabetic peers such as opportunities in any type of school activity and equal opportunities in employment.

On the other hand, the three items with the lowest rating scores, which reflected greatest impact on DQOLY, were as follow: item 8: How often do you feel restricted by your diet? (55.6%), item 12: How often do you find yourself explaining what it means to have diabetes? (63%), and item 22: How often do you find that your parents act like diabetes is their disease, not yours? (65.6%) (see Table 7). The subjects were concerned with their dietary restrictions the most. This finding was in agreement with the study finding of Faro (1999) that adolescents reported being most bothered by dietary restriction. This may be explained that the dietary control issue has been found to be the most difficult task in diabetes self-care management (Glasgow, 1999: 823). Some diabetic adolescents may not know how to adjust their diabetes regimen to fit their lifestyle (Ingersoll et al., 1986 cited by Faro, 1999), especially those who consume food with high fat content and high sugar content at unplanned time (Read, Harveywebster, & Usinger-Lesquereux, 1988 cited by Faro, 1999). Dietary restriction also makes adolescents feel they are different from peers. Besides, concerns about body weight and appearance may lead some adolescents, particularly girls, to develop non-appropriate patterns of eating or insulin use (La Greca & Hanson, 1995 cited by Faro, 1999).

According to the study finding, diabetes had great impact on the quality of life of 63% of the adolescents in this study. Such finding yielded support to the findings by Faro (1999) that almost a third of the subjects had to emphasize that diabetes was not contagious when explaining their diabetes to peer. On the other hand, only three subjects in Faro's study indicated that they never talked about their diabetes with friends. In addition, Pek, Yildirim, Akdovan, & Yilmaz, (2002) also found that the majority of Turkish children made their diabetes known to their friends (97.7%) and their teachers (95.3%). This may be because if the adolescents adopt a normalized view of management of the diabetes, then they would feel more confident at home and in community and social situations, contributing to adolescents' adjustment (Amer, 1999: 638). Thus, adolescents who cope well with diabetes will have no problem disclosing their diabetes to their peers.

It is worth noting that some parents act like diabetes is their own disease. Although adolescents can take responsibility for and perform diabetes management on their own, the parents may still be involved in day-to-day management of diabetes care regimen. Similarly, Weist et al. (1993 cited by Mrazek, 2002: 1235) found that parental involvement can help adolescents maintain optimal diabetes management and metabolic control. Thus, parental involvement, such as by trying to force their children to strictly take care of themselves (Kyngas, 2000: 265-266), are likely to cause diabetic adolescents to perceive that their parents act as if diabetes is their own disease.

Finally, concerning the worry subscale, the mean raw score was 45.6 (S.D. = 6.2) and the mean transformed score was 78.6 (S.D. = 14.0), thus being at a moderate level. The three items with the highest rating scores of the worry subscale, representing less worries and consequently reflecting better quality of life, were as follows: item 1: How often do you worry about whether you will get married? (90.6%), item 8: How often do you worry whether someone will not go out with you because you have diabetes? (89.4%), and item 2: How often do you worry about whether you will have children? (88.6%) (see Table 8). Since most subjects (76.5%) were early and middle adolescents, they may have felt less worried about their ability to be an adequate spouse and/or parent.

On the other hand, the three items with the lowest rating scores of the worry subscale, representing more worries and consequently reflecting poorer quality of life, were item 7: How often do you worry that you will get complications from your diabetes? (58.8%), item 3: How often do you worry about whether you will not get a job you want? (79.0%), and item 4: How often do you worry about whether you will pass out? (81.8%) (see Table 8). Such findings suggested that most subjects felt that the impact of diabetes on their psychological well-being was the greatest worry about their diabetic complications that they may develop in the future. These results were consistent with those reported by the study of Faro (1999) that 74% of the adolescents voiced the greatest worries for the future to include fear of having complications (blindness, kidney failure, or limb amputation), while another 17% were worried most about having a low blood sugar reaction. In the present study, 73.5% of the subjects had poor metabolic control, and 88.2% had hypoglycemic events in previous three months. Hypoglycemia is an acute complication that is a problem for diabetic persons who want to maintain tight control to avoid passing out, losing consciousness, or having convulsion. For this reason, fear related to developing hypoglycemia may have an impact on their psychological quality of life and be perceived as the greatest source of worry. In addition, the diabetic adolescents were also worried about their future career. This could be explained that many diabetic adolescents feel that they are different and have more social restrictions than their healthy peers (Kyngas, 2000: 265). Consequently, they feel that they need to cope with an interference with career choice more (Kanner, Hamrin, & Grey, 2003: 15).

Factors Predicting Quality of Life of Adolescents with Type 1 Diabetes

The findings revealed that metabolic control as indicated by recent HbA1c was negatively related to diabetic adolescents' quality of life ($r = -.202$, $p < .05$) and could predict quality of life of adolescents with Type 1 diabetes by 4.1%. This means that the better metabolic control as indicated by lower HbA1c of adolescents with Type 1 diabetes, the better the perceived quality of life. This finding was in agreement with the finding of Guttmann-Bauman, Flaherty, Strugger, & McEvoy (1998) that recent HbA1c was significantly associated with overall DQOLY and that recent HbA1c could predict overall DQOLY of adolescents with Type 1 diabetes by 18%

($\beta = 3.94$, $R^2 = 0.18$, $p = 0.05$). Similar findings were reported by a number of previous studies carried out by Rubin & Peyrot (1999), Hoey et al. (2001), Mortensen (2002), and Cameron (2003). Besides, Watkins et al. (2000) and Glasgow et al. (1997) found a negative relationship between HbA1c and quality of life. Poor metabolic control from frequent metabolic disorders such as chronic hyperglycemia and recurrent diabetic ketoacidosis (DKA) are likely to lead to hospitalization (Grey et al., 1998: 902), increased health complications, poor health status (DCCT, 1994: 177-188 cited by Delamater et al., 1999: 700), and reduced physical quality of life (Delamater et al., 1991: 20-25), as well as social quality of life (Bendtson, 1993: 141-152 cited by Rose et al., 1998: 1876). For this reason, the changes in metabolic control may affect the diabetic persons on quality of life, and better metabolic control is associated with better quality of life (Hoey et al., 2003: 7-12). However, this finding was inconsistent with those of the previous studies by Ingersoll & Marrero (1991), Grey et al. (1998), Faulkner (2003), & O'Neil, Jonnalagadda, Hopkins, & Kicklighter (2005) that the HbA1c was not correlated to DQOLY. Moreover, Laffel, Connell, Vangsness, Goebel-Fabbri, Mansfield, & Anderson (2003) pointed out that HbA1c could not predict quality of life which was assessed by PedsQL. Also, Graue et al. (2003) reported that HbA1c could not explain the variations in the DQOLY subscales. This may be because, in most studies, a single HbA1c level was used at the time of visit and there was a wide fluctuation of HbA1c levels from visit to visit in patient group studies, which might partially explain the fact that no correlation was found with quality of life (Guttmann-Bauman, Flaherty, Strugger, & McEvoy, 1998: 917). For this reason, in some studies both single and mean HbA1c were used. Moreover, small sample size may explain such findings because some larger studies have found a relationship (Ingersoll & Marrero, 1991). More importantly, however, from a practical standpoint, there is no reason to believe that efforts to improve metabolic control in adolescents with diabetes lead to deterioration of their quality of life (Graue, Wentzel-Larsen, Hanestad, Batsvik, & Sovik, 2003: 1195).

Another plausible explanation is that the diabetic adolescents who perceived the positive impact of good metabolic control on good quality of life may be better equipped physically and psychologically to deal with the burdens of diabetes management (Mortensen, 2003: 117).

Regarding self-care behaviors, the overall diabetes self-care behaviors consisted of eight core measures of dietary control, medication intake, physical activity, self-monitoring, problem solving, stress management, and reducing risks of diabetes complications. The findings revealed that the mean raw score of overall self-care behaviors of 128.0 was at a low level (S.D. = 25.1), or 57.1% (see Table 4). When considering each of the subscales, the subscale with the highest mean raw score was personal hygiene care (M = 15.3, S.D. = 4.6), or 76.5%, which was at a moderate level. In contrast, the subscale with the lowest mean raw score was self-monitoring (M = 8.5, S.D. = 2.8), or 38.6%, which was at a low level. According to these findings, it could be implied that the subjects in the present study perform self-care behaviors of self-monitoring the least (see Table 4). Such findings yielded support to Orem's Self-Care Model (1995) that individuals with diabetes perform self-care behaviors to meet their therapeutic self-care demands. It is worth noting that none of the subjects in the present study obtained a perfect score on the self-care behaviors questionnaire, thus indicating that they may have some partial self-care deficits.

With regard to the intercorrelations between the independent variables, it could be seen that recent HbA1c was negatively correlated with overall self-care behaviors at a rather low level ($r = -.249, p < .05$). This may be because even though most adolescents learn to take more responsibility for self-care tasks over time, they still need parental involvement, family guidance, and reminders in their daily diabetic self-care. In addition, the findings showed that overall self-care behaviors were positively correlated with overall DQOLY at a low level ($r = .385, p < .01$) (see Table 10) and could predict overall DQOLY of adolescent with Type 1 diabetes by another 12% (see Table 11). This means that the more frequently diabetic adolescents perform self-care behaviors, the better quality of life they have. The findings were consistent with those of previous studies by Banchang Sukcharearn et al. (B.E.2545), Kyngas & Hentinen (1995), and Rubin & Payrot (1999) that self-care behaviors was related to quality of life of school-age children, adolescents, and adults with diabetes. Furthermore, even when other instruments were used, similar findings have been reported. For instance, Harris et al. (2000) found that DSMP (Diabetes Self-Management Profile) was positively associated with DQOL in adolescents with Type 1 diabetes and 7% of the variance explained DQOL. One possible explanation is that

self-care behaviors performed by adolescents including daily insulin injection, self-monitoring of blood glucose, a prescribed meal plan, regular exercises, and problem-solving tactics to regulate blood glucose as well as having regular contacts with healthcare professionals (Songer, LaPorte, Lave, Dorman & Becker, 1997: 577) help them improve better metabolic control, decrease long-term complications, and consequently improve quality of life. Besides, diabetic adolescents who perceived more benefits of good self-care behaviors in diabetic treatment regimen also perceived better physical and mental health outcomes through perceived control of thinking of themselves as healthy and of having flexibility with self-care (Kyngas & Hentinen, 1995: 729-736). Consequently, they felt they had good health status and quality of life (Wysocki, Greco, Harris, Bubbs, & White, 2001: 441). For this reason, self-care behaviors affect quality of life.

The findings also revealed that gender was not related to diabetic adolescents' quality of life ($r = .057$, $p > .05$) and could not predict quality of life of adolescents with Type 1 diabetes. This means that the gender difference does not affect quality of life of diabetic adolescents. The findings were consistent with those of previous studies carried out by Jacobson, Groot, & Samson (1994), Laffel et al. (2003), and O'Neil, Jonnalagadda, Hopkins, & Kicklighter (2005) that gender was not related to quality of life and could not predict quality of life. This may be because in the Thai culture adolescents live with their two parents. In this study, most of the subjects, or 84.4% live with their two parents, 80.4% received information support from multidisciplinary team members, and 59.8% had attended the diabetes camp, all of which reflected that they received social support from their family members and relatives as well as external social support from friends, teachers, and healthcare providers. Such social support may help adolescents with coping and may buffer the adolescents against the pressure of chronic illness (Amer, 1999: 638). As a result, gender difference did not affect quality of life of adolescents with Type 1 diabetes in the present study. However, these findings were inconsistent with those of previous studies by Jacobson et al. (1997), Glasgow et al. (1997), Peyrot & Rubin (1998), Hoey et al. (2001), Camacho et al. (2002), Faulkner (2003), and Cameron (2003) that gender is correlated with quality of life. To further elaborate, males consistently have a better quality of life than females (Verbrugge, 1982: 417-437; Kandrack et al., 1991:

579-590 cited by Camacho et al., 2002: 784) in both Type 1 and Type 2 diabetes. This is because females seem to have lower treatment satisfaction, greater worries, and higher perceived diabetes burdens than males (Peyrot & Rubin, 1998 cited by Camacho et al., 2002: 784; Hoey et al., 2001: 1923-1928; Cameron, 2003: 132-136).

Also, family income was not related to diabetic adolescents' quality of life ($r = -.127$, $p > .05$), and could not predict quality of life of adolescents with Type 1 diabetes. Put another way, family income did not affect quality of life. This finding was incongruent with the study by Banchang Sukcharearn et al. (B.E.2545) that family income was positively correlated with quality of life in children and adolescents with Type 1 diabetes aged 7-20 years. Likewise, Sudjai Samithtikarn (B.E. 2541) also found that family income was positively correlated with quality of life in school-age children with chronic illness. This may be because persons with diabetes also suffer from increased financial burdens due to medical expenses. The subjects in the present study varied in terms of financial resources. For example, the largest group, or 38.2%, had family income between 15,001 and 20,000 baht/month, 50% had adequate income, and 36.3% had some savings. In addition, 84.4% of the subjects had primary family caregivers who were their two parents, and 81.4% of the parents were employed. Furthermore, 64.7% of the subjects received financial support from reimbursement for government officials, a 30-Baht healthcare card, or social security. Thus, there was no reason for financial strain or financial burden. For this reason, family income did not affect quality of life of the subjects in this study.

Besides, the findings also indicated that duration of diabetes was not related to diabetic adolescents' quality of life ($r = -.157$, $p > .05$) and could not predict quality of life of adolescents with Type 1 diabetes. This means that duration of diabetes did not affect quality of life. These findings were consistent with those of previous studies (Rubin & Payrot, 1999; Laffel et al., 2003) that duration of diabetes was not related to quality of life of adolescents with diabetes. In contrast, Sudjai Samithtikarn (B.E. 2541) conducted a study and discovered that duration of illness in school-age children with chronic illnesses was positively correlated with quality of life. On the other hand, previous studies (Ingersoll & Marrero, 1991; Peyrot & Rubin, 1997; Aalto et al., 1997; Klein et al., 1998, cited by Maddigan et al., 2003) also showed that duration of diabetes was negatively correlated with quality of life. One possible explanation is

that the adolescents may have lived with their diabetes for years and might have adapted to the life with a chronic illness (Graue et al., 2003: 1195). It may also be possible that the manifestations of complications are not yet present in this period, so there is not much impact on quality of life (Faulkner, 2003: 368). Another plausible explanation is that 59.8% of the subjects in the present study had attended a diabetes camp ranging from one to four times in frequency. A previous study has also confirmed the value of diabetic camps as an educational and therapeutic tool which can improve quality of life by increasing knowledge and self-management capacities (Mancuso & Caruso-Nicoletti, 2003: 35). Similar finding has been reported in the study of Pornsri Sriaussadaporn et al. (B.E.2545: 89). Therefore, diabetic children and adolescents should be encouraged to attend the diabetic camp to develop better self-care behaviors and promote better quality of life.

In conclusion, the findings of the present study suggested that the basic conditioning factors such as recent HbA1c and overall self-care behaviors could co-predict the variance in overall quality of life by 16.0%, while gender, family income, and duration of diabetes could not. As a consequence, the research hypothesis was only partially supported. The remaining 84% may have been explained by other factors that were not included in the present study and need further investigation in the future accordingly.

CHAPTER VI

CONCLUSION

The present predictive correlational study was designed to investigate the factors influencing quality of life of adolescents with Type 1 diabetes using Orem's Self-Care Model (Orem, 1995) as the conceptual framework of the study. The subjects consisted of 102 adolescents with Type 1 diabetes aged 12 to 18 years old who had been diagnosed with Type 1 diabetes for at least one year prior to data collection. The inclusion criteria included having undergone insulin therapy, being able to perform daily-activities, having schooling grade appropriate to age, being able to read, write, and communicate in the Thai language, having no mental retardation or psychiatric disorders, obtaining a recent HbA1c monitoring less than three months ago, and being willing to participate in the study with informed consent from their parents or caregivers. These diabetic adolescents received treatment or services at the Pediatric Endocrinology Clinic, Out-Patient Department, in four tertiary medical centers of Faculty of Medicine, Ramathibodi Hospital, King Chulalongkorn Memorial Hospital, Siriraj Hospital, and Pramongkutkloa Hospital from March to July 2005. The instruments used in this study included the demographic characteristics questionnaire, the Diabetes Quality of Life for Youth (DQOLY) Questionnaire, and the Self-Care Behaviors Questionnaire. Data analysis included descriptive analysis, Pearson's product moment correlation coefficient, and hierarchical and stepwise multiple regression analysis.

Summary of the Findings

The findings revealed that adolescents with Type 1 diabetes who participated in this study ranged in age from 12 to 18 years, with the mean age of 14.7 years (SD = 1.9). In this age group, slightly more than half (51%) were early adolescents (12-14 years), 25.5% were middle adolescents (15-16 years), and 23.5% were late adolescents (17-18 years). The majority of them (63.7%) were female, while 36.3% were male. In addition, 74.5% completed secondary education, with the average number of years of

formal education of 9.01 (SD = 2.23, range = 6-14). Moreover, the largest group, or 38.2%, had an average monthly family income between 15,001 and 20,000 baht (Median = 27,500, Mean = 38,020, SD = 2.23, range = 3,000-150,000). Half of them, (50%) had sufficient income with no savings, and 35.3% paid for medical expenses by themselves. Finally, in terms of information resources about diabetes care, most subjects, or 80.4%, received information from the multidisciplinary team. Besides, approximately 60% had attended a diabetes camp, whereas 40.2% never did. As regards frequency of attendance, more than half (54.1%) attended the camp for just one time, followed by two times (27.9%), three times (16.4%), and four times or more (1.6%), respectively.

According to clinical characteristics, the mean age of the onset was 9.6 years (SD = 3.4), and the mean duration of diabetes was 61.9 months (SD = 41.4). Furthermore, more than two-thirds of the subjects (69.6%) used conventional insulin treatment of two injections per day, while 30.4% used intensive insulin treatment of three to four injections per day. The average total insulin dosage was 1.03 unit/kg/day (SD = 0.28). Regarding diabetes self-care, close to three-quarters (72.5%) always did the injection by themselves, and approximately 38% monitored blood glucose two times per day, whereas only 3% did not monitor blood glucose. In addition, most of the subjects (88.2%) had snacks. In this group, 42.2% had one snack a day, followed by 38.9% who had two snacks per day, and only 18.9% had three snacks in one day. Moreover, most of the subjects (88.2%) had a hypoglycemia event in the past three months. In addition, 65.6% had hypoglycemia one to four episodes per week, followed by 24.4% who had one episode per month, and 10% who had one episode in two to three months. Recent HbA1c in this group of subjects varied from 5.7% to 13.7%, with the mean recent HbA1c of 9.2% (SD=1.7). One interesting finding was that nearly three-quarters (73.5%) had poor metabolic control level as indicated by recent HbA1c of > 8%, while only a few (8.8%) had good metabolic control. Finally, 15.4% of female subjects were clinically obese, whereas 16.2% of male subjects suffered from obesity.

Regarding the caregiver characteristics, most (84.3%) lived with the diabetic adolescents, and more than three-quarters of them (86.3%) were married. With regard to educational background, 33.3% held a bachelor's degree. In terms of employment,

close to one-third, or 30.4%, were government officials or public enterprise employees, and only 18.7% were unemployed.

It is worth noting that the subjects had overall self-care behaviors at a rather low level (mean = 128.0, S.D = 25.1). As regards each subscale, the highest mean raw score was personal hygiene care (M = 15.3, S.D = 4.6), or 76.5%, which was a moderate level. On the other hand, the lowest mean raw score was self-monitoring (M = 8.5, S.D = 2.8), or 38.6%, which was a low level.

As regards the raw scores of overall quality of life and each subscale, the subjects had perceived satisfaction, impact, and worries subscales, as well as overall DQOLY at a moderate level (mean = 61.6, SD = 8.2; mean = 87.8, SD = 10.6; mean = 45.6, SD = 6.2; mean = 191.1, SD = 19.9; respectively). On the other hand, half of the subjects (51%) perceived their health status as good.

As for the relationships, it was found that recent HbA1c was negatively correlated with overall DQOLY at a rather low level ($r = -.202$, $p < .05$). In contrast, overall self-care behaviors were positively correlated with overall DQOLY at a low level ($r = .385$, $p < .01$). However, gender, family income, and duration of diabetes were not correlated with overall DQOLY ($r = .057$, $p > .05$; $r = -.127$, $p > .05$; $r = -.157$, $p > .05$, respectively). Besides, hierarchical and stepwise multiple regression analysis indicated that recent HbA1c could predict overall DQOLY by 4.1% ($F_{(1,100)} = 4.266$, $p < .05$) and overall self-care behavior could predict overall DQOLY by another 12.0% ($F_{(1,99)} = 14.106$, $p < .001$). Thus, overall self-care behavior and recent HbA1c could co-predict overall DQOLY by 16.1% ($F_{(2,99)} = 9.465$, $p < .001$). In brief, overall self-care behavior were the strongest predictor (Beta = .357, $p < .001$) of overall DQOLY of adolescents with Type1 diabetes.

Limitations of the Study

1. The self-care behaviors questionnaire was a new tool developed by the researcher to assess quality of self-care to meet the therapeutic self-care demands for adolescents with Type 1 diabetes receiving insulin therapy. It consisted of eight core measures. The self-care behaviors measure was difficult to interpret because the rating scales were not the same in the measurement of self-care behaviors in three parts, and there was no gold standard measure for comparison. Further testing of the self-care

behaviors is thus needed to confirm the validity and reliability of the questionnaire in both subscales and overall self-care behaviors.

2. As purposive sampling was employed in the present study, there was no random selection of the subjects, so generalization of the study findings to other groups of adolescents with Type 1 diabetes may be limited.

3. Limitation of the time frame and a small sample size in the present study prevented the researcher from fully exploring the impact of quality of life on DQOLY subscales.

4. All data were collected by means of self-administrated instruments, which are subjective in nature and tend to be biased in the direction of over-reporting self-care behaviors or under-reporting their true impacts on quality of life.

5. Although the same method was used to measure the HbA1c level in this multi-center study, Quality Control (QC) may differ in each of the settings.

6. Due to its cross-sectional design, this study did not allow the causal conclusion. This design also has limitations in assessing changes over time.

Implications and Recommendations

The findings revealed that diabetes and treatments had effects on adolescents' quality of life. Furthermore, the findings also clearly indicated the effects of selected basic conditioning factors such as metabolic control (recent HbA1c) and self-care behaviors on quality of life of adolescents with Type 1 diabetes. It was also found that overall self-care behaviors and recent HbA1c could co-predict overall DQOLY of adolescents with Type 1 diabetes, hence yielding further support to Orem's conceptual model of nursing. Based on these findings, it could be concluded that improving metabolic control through self-care behaviors contributes to enhancement of well-being or quality of life of adolescents with Type 1 diabetes. Thus, the following recommendations are made:

Implications for nursing practice

1. According to the research findings, overall self-care behaviors are positively correlated to overall DQOLY at a low level and overall self-care behavior could predict overall DQOLY by 12%. Another factors that should also be taken into

consideration is perceived social support because social support has a positive effect on health and adjustment of adolescents with a chronic illness. As self-care behaviors are important for diabetes care and contribute to health and well-being, although most adolescents take more responsibility for self-care tasks over time, they still need an encouragement and support from family, healthcare team members and social network such as friends and teachers to continue their daily care. Nurses should also help parents and family members understand the necessity of helping and lessening adolescents' burden to allow adolescents to have supervision, as well as to receive constant support and encouragement.

2. The research results point out that the overall self-care behaviors of adolescents with Type 1 diabetes were at a rather low level and that self-monitoring was a self-care task which adolescents performed less than others. Thus, nurses who work with diabetic adolescents should assess and prepare adolescents and families before they begin their self-care responsibility by teaching them how to take care of themselves and how to deal with diabetes. An education program provided to them should emphasize how to improve self-care behaviors with not only insulin injection behaviors but also other multidimensional behaviors such as self-monitoring and coping behaviors.

3. The findings of the present study also shed some light on understanding of good metabolic control and self-care behaviors that influence quality of life of adolescents with Type 1 diabetes. Such understanding can help guide nurses to arrange effective nursing interventions such as coping skill training that are specific and appropriate for adolescents to enhance their quality of life.

4. Quality of life, along with the clinical outcomes, should be regarded as an important criterion in evaluating the outcomes of diabetes treatment. During clinic visits, assessment should include not only clinical outcomes such as blood pressure, BMI, and HbA1c level, but also constant monitoring and assessment of the impact of diabetes and its treatment to ensure diabetic adolescents' well-being. Nurses should also be aware that diabetic adolescents may be filled with diabetes-related worries, depressive symptoms, or other psychological health complaints with diabetes, and they should be given the opportunity to privately discuss any burden or their worries about having diabetes with the multidisciplinary team in an outpatient setting or in special

clinic such as the adolescence clinic. This is because their perception could be useful in the counseling and consequently lead to an improvement of psychological health and quality of life

Recommendations for further research

1. Other factors which affect quality of life of adolescent with Type 1 diabetes should be investigated in further studies such as social support because social support networks such as family, friends, and teachers can be the most important source of support that facilitates coping and promotes quality of life of diabetic adolescents who have to live with diabetes.

2. Future studies should be conducted to determine the factors influencing self-care behaviors and metabolic control such as self-efficacy, social support, and family income to shed more light on the issue.

3. Further studies should investigate the effectiveness of an intervention program aimed at improving both self-care behaviors and metabolic control, with an emphasis on enhancing quality of life of adolescents with Type 1 diabetes.

4. In the future, the factors that have an impact on DQOLY subscales of adolescents with Type 1 diabetes should also be explored.

5. Regarding methodological issues, to more confidently generalize the findings of a study, a larger sample size using a randomized sampling technique should be employed in further studies. A longitudinal design is also recommended to evaluate changes over time to reflect long-term outcomes of self-care behaviors and metabolic control. Using both measures of generic and diabetes-specific quality of life to evaluate quality of life, further studies may capture issues of particular concern in relation to diabetes. They may also possibly make comparisons across different diabetes or healthy populations. As regards data collection method, a questionnaire should be considered to involve both self-report and parental report to better explore the impact of diabetes on quality of life from both inside perspectives of adolescents and outside views of their parents or caregivers. Also, in-depth interviews may also be employed as a means to explore the reasons for such perceptions. Last but not least, the Self-Care Behaviors and DQOLY Questionnaire should be re-examined to confirm the validity and reliability in other settings as well.

BIBLIOGRAPHY

- Aalto, A-M., Uutela, A., & Aro, A. R. (1997). Health related quality of life among insulin-dependent diabetes: disease-related and psychosocial correlates. *Patient Education and Counseling*, 30, 215-225.
- American Academy of Physician Assistants (JAAPA) (2002). Straight talk about teen diabetes. Retrieved May 7, 2004, from http://www.drugtopics.com/be_core/content/journals/j/data/2002/0501/wteendia...
- American Diabetes Association. (1997). Insulin administration. *Diabetes Care*, 20(suppl. 1), S49.
- American Diabetes Association. (2002). Implications of the diabetes control and complication trial. *Diabetes Care*, 25(suppl.1), S25-27.
- American Diabetes Association. (2002). Tests of Glycemia in Diabetes. *Diabetes Care*, 25(suppl.1), S97-99.
- American Diabetes Association. (2002). Care of Children with diabetes in the school and day care setting. *Diabetes Care*, 25(suppl. 1), S122-126.
- American Diabetes Association. (2004). Standard of medical care in diabetes. *Diabetes Care*, 27(suppl.1), S15-35.
- American Diabetes Association. (2004). Nutrition principles and recommendations in diabetes. *Diabetes Care*, 27(suppl.1), S42.
- American Diabetes Association. (2004). Physical activity/exercise and diabetes. *Diabetes Care*, 27(suppl.1), S58-62.
- American Diabetes Association. (2004). Tests of Glycemia in Diabetes. *Diabetes Care*, 27(suppl.1), S91-93.
- American Diabetes Association. (2004). Insulin administration. *Diabetes Care*, 25(suppl.1), S106-110.
- American Diabetes Association. (2004). Diabetes care at diabetes camp. *Diabetes Care*, 25(suppl.1), S129-131.
- American Diabetes Association. (2004). Third-party reimbursement for diabetes care, self-management education, and supplies. *Diabetes Care*, 25(suppl.1),

S136-137.

American Psychological Association (APA) (2001). *Publication Manual of the American Psychological Association* (5th ed.). Washington, DC: American Psychological Association.

Amer, K. S. (1999). Children's adaptation to insulin dependent diabetes mellitus: A critical review of the literature. *Pediatric Nursing*, 25(6), 627-641.

Bearman, K.J., & La Greca, A.M. (2002). Assessing friend support of adolescents' diabetes care: The diabetes social support questionnaire-friends version. *Journal of Pediatric Psychology*, 27(5), 417-428.

Beaser, R.S., Garbus, S.B., & Jacobson, A.M. (1996). Diabetes mellitus. In B. Spilker (Ed.), *Quality of Life and Pharmacoeconomics in Clinical Trials* (2nd ed., pp.983-991). Philadelphia: Lippincott-Raven.

Belchetz, P., & Hammond, P.J. (2003). Diabetes in special groups. In P. Belchetz & P.J. Hammond (Eds.), *Diabetes and Endocrinology*. (pp.141-143). Edinburgh: Mosby.

Bergner, M., Bobbitt, R., Pollard, W., et al. (1976). The sickness impact profile: Validation of a health status measure. *Med Care*, 14(1), 57.

Betschart, J. (1997). Alterations in Endocrine function. In W. L.Votroubek & J. L.Townsend (Eds.), *Pediatric Home Care*. (2nd ed., pp. 201-250). Maryland: Apen.

Bloomgarden, Z. T. (1998). International diabetes federation meeting, 1997. *Diabetes Care*, 21(5), 860.

Boland, E. A., & Grey, M. (2000). Diabetes Mellitus (Type 1). In P.L.Jackson & J.A.Vessey. (Eds.), *Primary care of the children with a chronic condition*. (3rd. ed., pp. 426-444). St.Louis: Mosby.

Boland, E., Monsod, T., Delucia, M., Brandt, C.A., Fernando, S., & Tamborlane, W.V. (2001). Limitations of conccentional methods of Self-monitoring of blood glucose. *Diabetes Care*, 24 (11), 1858-1862.

Bott, U., Muhlhauser, I., Overmann, H. & Berger, M. (1998). Validation of a Diabetes-Specific Quality of Life Scale for patients with type 1 diabetes. *Diabetes Care*, 21(5), 757-769.

- Bouma, R., & Schweitzer, R. (1990). The impact of chronic childhood illness on family stress: A comparison between autism and cystic fibrosis. *Journal of Clinical Psychology, 46*, 722-730.
- Brown, J., Rawlinson, M., & Hilles, N. (1981). Life satisfaction and chronic disease: Exploration of a theoretical model. *Med Care, 19*(11), 1136.
- Camacho, F., Anderson, R.T., Bell, R.A., Goff, D.C., Duren-Winfield, Jr.V., & Doss, D.D., et al. (2002). Investigating correlates of health related quality of life in a low-income sample of patients with diabetes. *Quality of Life Research, 11*, 783-796.
- Cameron, F. J. (2003). The impact of diabetes on health-related quality of life in children and adolescents. *Pediatric Diabetes, 4*, 132-136.
- Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, (2003). Psychosocial aspects of diabetes. *Clinical Practice Guidedlines*, S50-52.
- Cara, J.F. (1999). Psychosocial aspects of Type 1 diabetes mellitus in the selection of resources by European Association for the Study of Diabetes 1999 Annual Meeting. Retrieved May 5, 2004, from <http://www.diabetesliving.com/coping/psyc.htm>
- Caratensen, L., Cone, L. (1983). Social desirability and measurement of psychological well-being in elderly persons. *J Gerontol, 38*(6), 713.
- Cavusoglu, H. (2001). Self-esteem in adolescence: A comparison of adolescents with diabetes mellitus and leukemia. *Peiatric Nursing, 27*(4), 355-361.
- Chase, H. P., & Eisenbarth, G. S. (2003). Diabetes Mellitus. In W.W. Hay, A.R. Hayward, M.J.Levin, J. M. Sondheimer. and Associate Authors (Eds.), *Current Pediatric Diagnosis & Treatment*, (16thed., pp. 978-985). New York: McGraw-Hill.
- Chokephichit, P. (2003). *Self-care of chronic renal failure patients undergoing Hemodialysis*. Master's thesis in Nursing Science (Adult Nursing), Faculty of Graduate Studies, Mahidol University.
- Constitution of World Health Organization (WHO) (1952). In *World Health Organization: Handbook of Basic Documents*, (5th ed., pp.3-20). Geneva:

Palais des Nation.

- D'Auria, J. P., Christian, B. J., Henderson, Z. G., & Haynes, B. (2000). The company they keep: The influence of peer relationships on adjustment to cystic fibrosis during adolescence. *Journal of Pediatric Nursing*, 15(3), 175-182.
- Dashiff, C. & Bartolucci, A. (2002). **Autonomy** development in adolescents with insulin dependent diabetes mellitus. *Journal of Pediatric Nursing*, 17(2), 96-106.
- Davidson, M., Boland, E. A. & Grey, M. (1997). Teaching teens to cope: Coping skill training for adolescents with insulin-dependent diabetes mellitus. *Journal of the Society of Pediatric Nursing*, 2(2), 65-71.
- Dean, H. (1985). Choosing multiple instruments to measure quality of life. *Oncol Nurs Forum*, 12, 96-100.
- Delamater, A.M., Kurtz, S.M., Bubb, J., White, N.H., & Santiago, J.V. (1987). Stress and coping in relation to metabolic control of adolescents with Type 1 diabetes. *J Devel Behav Pediatr*, 8, 136-140.
- Delamater, A.M., Albrecht, D.R., Postellon, D.C., & Gutal, J.P. (1991). Radial differences in metabolic control of children and adolescents with Type 1 diabetes mellitus. *Diabetes Care*, 14, 20-25.
- Delamater, A. M., Shaw, K.H., Applegate, E.B., Pratt, I.A., Eidson, M & Lancelotta, G.X., et al., (1999). Risk for metabolic control problems in minority youth with diabetes. *Diabetes Care*, 22(5), 700-705.
- DeSouza, M.S., & Nairy, K.S. (2003). Nursing intervention for the quality of life of diabetic adults. *Clinical Effectiveness in Nursing*, 7, 63-72.
- Devendra, D., Liu, E., & Eisenbarth, G.S. (2004). Type 1 diabetes: recent Developments. *BMJ*, 328(27), 750-754.
- Diabetes Forum. (n.d.). Diabetes-Treatment: Management of Children with Diabetes. Retrieved May 5, 2004, from http://www.diabetesforum.net/cgi-bin/display_engine.pl?category_id=6&content_
- Elbagir, M.N., Etayeb, N.O., Eltom, M.A., Mahadi, E.O., Wikblad, K., & Berne, C. (1999). Health-related quality of life in insulin-treated diabetic patients in the Sudan. *Diabetes Research and Clinical practice*, 46, 65-73.

- Faro, B. (1999). The effect of diabetes on adolescents's quality of life. *Pediatric Nursing*, 25, (issue 3), 247-255.
- Farquhar, M. (1995). Definition of quality of life: a taxonomy. *Journal of Advanced Nursing*, 22, 502-508.
- Faulkner, M. S. (2003). Quality of life for adolescents with Type 1 diabetes: Parental and youth perspectives. *Pediatric Nursing*, 29(5), 362-368.
- Ferrans, C.E., & Powers, M.J. (1985). Quality of life index: Development and psychometric properties. *Advances in Nursing Science*, 8 (1), 15-24.
- Fletcher, A., Bulpitt, C. (1985). The treatment of hypertension and quality of life. *Qual Life Cardiovasc Care*, 1(3), 140.
- Frey, M.A., Ellis, D., Naar-King, S., & Greger, N. (2004). Diabetes management in adolescents in poor metabolic control. *The Diabetes Educator*, 30(4), 647-657.
- Friedland, J., & McColl, M. (1987). Social support and psychosocial dysfunction after stroke: buffering effects in a community sample. *Arch Phys Med Rehabil*, 68(8), 475-480.
- Fosbury, J.A., Bosley, C.M., Ryle, A., Sonksen, P.H., & Judd, S.L. (1997). A trial of cognitive analytic therapy in poorly controlled Type 1 patients. *Diabetes Care*, 20(6), 959-964.
- Garratt, A. M., Schmidt, L., & Fitzpatrick, R. (2002). Patient-assessed health outcome measures for diabetes: a structured review. *Diabetes UK. Diabetes Medicine*, 19: 1-11.
- Gilbert, G. L., Christensen, J. & Conway, M. E. (n.d.). Benefits of Glycemic control Retrieved February 1, 2004, from file://E\Benefits of Glycemic Control-Text Course.htm
- Glasgow, A. M. (1992). Diabetes Mellitus. In W. Hung (Ed), *Clinical Pediatric Endocrinology* (pp. 313-331). St.Louis: Mosby.
- Glasgow, R. E., Ruggiero, L., Eakin, E. G., Drtfoods, J., & Chobanian, L. (1997). Quality of life and associated characteristics in a large national sample of adults with diabetes. *Diabetes Care*, 20(4), 562-567.
- Graue, M., Wentzel-Larsen, T., Hanestad, B. R., Batsvik, B., & Sovik, O. (2003). Measuring self-report, health-related quality of life in adolescents with Type 1 diabetes using both generic and disease-specific instruments. *Acta Paediatrica*,

- 92(10), 1190-1196. Retrieved December 12, 2003, from Ovid database.
- Grant, M.M., Padilla, G.V., Ferrel, B.R., & Rhiner, M. (1990). Assessment of quality of life with a single instrument. *Seminars in Oncology Nursing*, 6(4), 260-270.
- Grey, M., Boland, E. A., Davidson, M., Yu, C., Sullivan-Bolyai, S. & Tamborlane, W.V. (1998). Short-term effects of coping skills training as adjunct to intensive therapy in adolescents. *Diabetes Care*, 21(6), 902-908.
- Grey, M., Boland, E. A., Yu, C., Sullivan-Bolyai, S., & Tamborlane, W. V. (1998). Personal and family factors associated with quality of life in adolescents with diabetes. *Diabetes Care*, 21(6), 909-914.
- Grey, M., Cameron, M.E., Lipman, T.H., & Thurber, F.W. (1994). Initial adaptation in children with newly diagnosed diabetes and healthy children. *Pediatric Nursing*, 20(1), 17-21.
- Grey, M., Lipman, T., Cameron, M. E., & Thurber, F. W. (1997). Coping behaviors at diagnosis and in adjustment one year later in children with diabetes. *Nursing Research*, 46(6). 312-317.
- Grey, M., Davidson, M., Boland, E.A., & Tamborland, W.V. (2001). Clinical and Psychosocial factors associated with achievement of treatment goals in adolescents with diabetes mellitus. *Journal of Adolescent Health*, 28, 377-385.
- Grossman , H. Y., Brink, S., & Hauser, S. T. (1987). Self-efficacy in adolescent girls and boys with insulin-dependent diabetes mellitus, *Diabetes Care*, 10(3), 324.
- Guttmann-Bauman, I., Flaherty, B. P., Strugger, M., & McEvov, R.C. (1998). Metabolic control and quality of life self-assessment in adolescents with IDDM. *Diabetes Care*, 21(6), 915-918.
- Hahl, J., Hamalainen, H., Sintonen, H., Simell, T., Arinen, S., & Simell, O. (2002). Health-related quality of life in type 1 diabetes without or with symptoms of long-term complications. *Quality of Life Research*, 11, 427-436.
- Hanson, C.L., Harris, M.A., Relyea, G., Cigrang, J.A., Carle, D.L., & Burghen, G.A. (1989). Coping styles in youths with insulin-dependent diabetes mellitus. *J Consult Clin Psychol*, 57, 644-651.
- Hanucharunkul, S. (1988). *Social support, self-care, and quality of life in cancer patients receiving radiotherapy in Thailand*. Doctoral's thesis in Nursing Science, Wayne State University.

- Hampson, S.E., Skinner, T.C., Hart, J., Storey, L., Gage, H., & Foxcroft, D., et al. (2000). Behavioral intervention for adolescents for adolescents with Type 1 diabetes. *Diabetes Care*, 23(9), 1416-1422.
- Haris, M. D., & Holvel, S. M. (1991). Living with insulin-dependent diabetes: Psychosocial ramification. In J. K. Davidson (Ed). *Clinical Diabetes Mellitus: A Problem-Oriented Approach*, (2nd ed., pp. 684- 693), New York: Thieme Medical Publishers.
- Harris, M.A., Wysochi, T., Sadler, M., Wilkinson, K., Harvey, L.M., & Buckloh, L.M., et al. (2000). Validation of a structured interview for the assessment of diabetes self-management. *Diabetes Care*, 23(9), 1301-1304.
- Herman, W. H. (1999). Glycemic control in diabetes. *BMJ*, 319 (10), 104-106.
- Hinds, P.S. (1990). Quality of life in children and adolescents with cancer. *Semin Oncol Nurs*, 6(4), 285-291.
- Hinds, P.S., & Varrichio, C.G. (1996). Quality of life: The nurse perspective. In B. Spilker (Ed.), *Quality of Life and Pharmacoeconomics in Clinical Trials* (2nd ed., pp.529-533). Philadelphia: Lippincott-Raven.
- Hoey, H., Aanstoot, H., Chiarelli, F., Daneman, D., Danne, T., & Dorchy, H., et al. (2001). Good metabolic control is associated with better quality of life in 2,101 adolescents with type 1 diabetes. *Diabetes Care*, 24(11), 1923- 1928.
- House, P., Livingston, R., & Swinburn, C. (1975). Monitoring mankind: The search for quality. *Behav Sci*, 20, 57.
- Ingersoll, G. M., & Marrero, D. G. (1991). A modified quality of life measure for youths: Psychometric properties. *The Diabetes Educator*, 17, 114-118.
- International Society for Pediatric and Adolescent Diabetes (ISPAD) (2000). *ISPAD Consensus Guidelines for the Management of Type 1 Diabetes Mellitus in Children and Adolescents*, Oslo: Medical Forum International.
- Jacobson, A.M., Hauser, S.T., Wolfsdorf, J.I., Houlihan, J., Milley, J.E., Herskowitz, R.D., et al. (1987). Psychologic predictors of compliance in children with recent onset of diabetes mellitus. *The Journal of Pediatrics*, 110(5), 805-811.
- Jacobson, A. M., Groot, M. D. & Samson, J. A. (1994). The evaluation of two measure of quality of life in patients with type 1 and type 2 diabetes. *Diabetes Care*, 17(4), 267-274.

- Jacobson, A.M., Hauser, S.T., Willett, J.B., Wolfsdorf, J.I., Dvorak, R., & Herman, L., et al. (1997). Psychological adjustment to IDDM: 10-year follow-up of an onset cohort of child and adolescent patients. *Diabetes Care*, 20(5), 811-818.
- Jacobson, A.M., de Groot, M., & Samson, J.A. (1997). The effects of psychiatric disorders and symptoms and quality of life in patients with Type 1 and Type 2 diabetes mellitus. *Quality of Life Research*, 6, 11-20.
- Jacobson, A.M., & The Diabetes Control and Complication Trial Research Group (DCCT). (2001). The diabetes quality of life measure. In C. Bradley (Ed.), *Handbook of Psychology and Diabetes* (3rd ed., pp. 65-87). Australia: Harwood Academic.
- Jangtrakoon, N. (2003). *Self-care burden and quality of life of patients with osteoarthritis of the knee*. Master's thesis in Nursing Science (Adult Nursing), Faculty of Graduate Studies, Mahidol University.
- Juvenile Diabetes Research Foundation. (2004, February 24). Health connection: What is diabetes?. In *Community Health Charities Minnesota*. Retrieved May 5, 2004, from <http://www.jdrf.org>
- Kanner, S., Hamrin, V., & Grey, M. (2003). Depression in adolescents with diabetes. *Journal of Child and Adolescent Psychiatric Nursing*, 16(1), 15-24.
- Karvonen, M., Vhk-Kajander, M., Moltchanova, E., Libman, I., LaPorte, R., & Tuomilehto, J. (2000). Incidence of childhood Type 1 diabetes worldwide. *Diabetes Care*, 23(10), 1516-1526.
- Kaufman, F.R., Gibson, L.C., Halvorson, M., Carpenter, S., Fiasher, L.K., & Pitukcheewanont, P. (2001). A pilot study of the continuous glucose monitoring system, *Diabetes Care*, 24(12), 2030-2034.
- Kaufman, F. R., Halvorson, M., & Carpenter, S. (1999). Association between diabetes control and visits to a multidisciplinary pediatric diabetes clinic. *Pediatric*, 103(5), 948-951.
- Keeratiyutawong, P. (2004). *A self-management program for improving knowledge, self-care activities, quality of life, and glycosylated HbA1c in Thais with Type 2 diabetes mellitus*. Doctoral's thesis in Philosophy (Nursing), Mahidol University.

- King, C. R. & Hinds, P. S. (Eds.). (1998). *Quality of Life From Nursing and Patient Perspectives*, Boston: Jones and Bartlett.
- King, K. M. (2003). Diabetes: classification and strategies for integrated care. *British Journal of Nursing*, 12(20), 1205.
- Kidhathong, S. (2003). *Hope, sense of coherence, and quality of life of adolescents students of parents with HIV/Aids*. Master's thesis in Nursing Science (Psychiatric and Mental Health Nursing), Faculty of Graduate Studies, Mahidol University.
- Kovacs, M., Goldston, D., Obrosky, D.S., & Bonar, L.K. (1997). Psychiatric disorders in youths with IDDM: Rates and risk factors. *Diabetes Care*, 20(1), 36-44.
- Kyngas, H. (2000). Compliance of adolescents with diabetes. *Journal of Pediatric Nursing*, 15(4), 260-267.
- Kyngas, H., & Barlow, J. (1995). Diabetes: An adolescent's perspective. *Journal of Advanced Nursing*, 22(5), 941-947.
- Kyngas, H., & Hentinen, M. (1995). Meaning attached to compliance with self-care, and conditions for compliance among young diabetics. *Journal of Pediatric Nursing*, 21, 729-736.
- Laborde, J., & Power, M. (1980). Satisfaction with life for patients undergoing hemodialysis and patients suffering from osteoarthritis. *Res Nurs Sci*, 8(1), 15.
- Laffel, L. B., Connell, A., Vangsness, L., Goebel-Fabbri, A., Mansfield, A., & Anderson, B. (2003). General quality of life in youth with Type 1 diabetes. *Diabetes Care*, 26(11), 3067-3073.
- La Greca, A.M., Follansbee, D., & Skyler, J.S. (1990). Developmental and behavioral aspects of diabetes management in youngsters. *Children's Health Care*, 19, 132-139.
- Landt, K.W., Campaigne, B.N., James, F.W., & Sperling, M.A. (1985). Effect of exercise training on insulin sensitivity in adolescents with Type 1 diabetes. *Diabetes Care*, 8(5), 461-465.
- Leonard, B. J., Jang, Y-P., Savik, K., Plumbo, P. M., & Christensen, R. (2002). Psychosocial factors associated with levels of metabolic control in youth with Type 1 diabetes. *Journal of Pediatric Nursing*, 17(1), 28-37.

- Lerner, M. (1973). Conceptualization of health and social well-being. *Health Services Res*, 8, 6.
- Lewis, F.M. (1982). Experienced personal control and quality of life in late state cancer patients. *Nurs Res*, 6, 219-225.
- Likitmaskul, S., Morris, S., Chaichanwatanakul, K., Angsusingha, K., Kiattiaakthavee, P., & Tuchinda, T. (1999). Type 1 diabetes in Thai children aged 0-14 years. *J Med AssoThai*, 82(8), 826-832.
- Lowes, L., & Lyne, P. (2000). Chronic sorrow in parents of children with newly diagnosed diabetes: a review of the literature and discussion of the implications for nursing practice. *Journal of Advanced Nursing*, 32(1): 41-48.
- Luk, W.S-C. (2004). The HRQOL of renal transplant patients. *Journal of Clinical Nursing*, 13, 201-209.
- Maddigan, S.L., Majumdar, S.R., Toth, E.L., Feeny, D.H., & Johnson, J.A. (2003). Health-related quality of life deficits associated with varying degrees of disease severity in type 2 diabetes. *Health and Quality of Life Outcomes*, 1. Retrieved February 1, 2004, from <http://www.hqlo.com/content/1/1/78>
- Mancuso & Caruso-Nicoletti. (2003). Summer camp and quality of life in children and adolescents with Type 1 diabetes. *Acta Bio Medica*, 74(suppl.1), 35-37.
- Meesuk, W. (2005). *The factors predicting health status of caregivers of stroke patients*. Master's thesis in Nursing Science (Adult Nursing), Faculty of Graduate Studies, Mahidol University.
- Mrazek, D.A. (2002). Insulin-dependent diabetes mellitus. In M. Lewis (Ed.). *Child and Adolescent Psychiatry*. (3rd ed., p1235). Philadelphia: Lippincott Williams & Wilkins.
- McCaleb, A., & Cull, V. V. (2000). Sociocultural influences and self-care practices of middle adolescents. *Journal of Pediatric Nursing*, 15(1), 30-35.
- McDaniel, R.W., & Bach, C.A. (1994). Quality of life: a concept analysis. *Rehabil Nurs Res* 3(1), 18-22.
- Mortensen, H.B. (2002). Finding from the Hvidore study group on childhood diabetes: Metabolic control and quality of life. *Hormone Research*, 67(suppl.1), 117-120.
- Mulchy, K., Maryniuk, M., Peebles, M., Peyrot, M., Tomky, D., Weaver, T., et al.

- (2003), Diabetes self-management education core outcomes measures. *The diabetes Educator*, 29(5), 768-788.
- Munro, B.H., Jacobsen, B.S., Dussy, M.E., & Braitman, L.E. (2001). Introduction to inferential statistic and hypothesis testing. In B.H. Munro (Ed.) *Statistical methods for health care research* (4th ed., pp 63-94). Philadelphia: Lippincott Williams & Wilkins.
- Murdaugh, C. (1992). Health-related quality of life as an outcome in organizational Research. *Medical Care*, 35(11), NS41-NS48.
- National Diabetes Education Program (NDEP). (n.d.). Diabetes in Children and Adolescents. Retrieved February 1, 2004, from <http://www.nedp.nih.gov/index.htm>
- National Statistical Office. (2000). Retrieved February 1, 2004, from <http://web.nso.go.th/eng/en/stat/socio/soctab3.htm>
- O'Neil, K.L., Jonnalagadda, S.S., Hopkins, B.L., & Kicklighter, J.R. (2005). Quality of life and diabetes knowledge of young persons with Type 1 diabetes: Influence of treatment modalities and demographics. *Journal of the American Dietetic Association*, 105(1), 85-91.
- Orem, D.E. (1985). *Nursing: Concept of practice*. (3rd ed.). New York: McGraw-Hill.
- Orem, D.E. (1991). *Nursing: Concept of practice*. (4th ed.). Philadelphia: Mosby Year Book.
- Orem, D. E. (1995). *Nursing: Concept of practice*. (5th ed.). St.Louis: Mosby Year Book.
- Orr, D. P. (2002). Diabetes mellitus. In L.S.Neinstein (Ed.), *Adolescent Health Care A Practical Guide* (4th ed., pp. 250-263). Philadelphia: Lippincott Williams & Wilkins.
- Orr, D. P., Golden, M. P., Myers, G., & Marrero, D. G. (1983). Characteristics of adolescents with poorly controlled diabetes referred to a tertiary care center. *Diabetes Care*, 6(2), 170-175.
- Pek, H., Yildirim, Z., Akdovan, T., & Yilmaz, S. (2002). Self-esteem in Turkish diabetic children. *Journal of Pediatric Nursing*, 17(4), 279-282.
- Pender, N. J. (1982). *Health Promotion in Nursing Practice*. Standford, Connecticut: Appleton & Longe.

- Petcharatna, T. (2002). *The effect of self-care agency developing program on self-care behaviors and health status of school-age children with sinusitis*. Master's thesis in Nursing Science (Pediatric Nursing), Faculty of Graduate Studies, Mahidol University.
- Peyrot, M., & Rubin, R.R. A new quality of life instruments for patients and families. Paper presented at the Psychological Aspects of Diabetes Study Group Third Scientific meeting, Madrid April 4-6 1998.
- Pita, R., Fotakopoulou, O., Kiosseoglou, G., Zafiri, M., Roikou, K., Simos, G., et al., (2002). Depression, quality of life and diabetes mellitus. *Hippokratia*, 6(suppl.1), 44-47.
- Puavilai, A. (2000). Concept analysis: Quality of life. *Thai Journal Nursing Research*, 4(1), 20-29.
- Polit, D. F. & Beck, C. T. (2003). Analyzing quantitative data: Multivariate statistics. In *Nursing Research: Principles and Methods*. (7th ed., pp. 521-522). Philadelphia: Lippincott Williams & Wilkins.
- Polonsky, W. H. (2000). Understanding and Assessing Diabetes-Specific Quality of Life. *Diabetes spectrum*, 13(36). Retrieved May 12, 2004, from <http://journal.diabetes.org/diabetesspectrum/00v13n1/pg21.htm>
- Rew, L., & Horner, S. D. (2003). Youth resilience Framework for reducing health-Risk behaviors in adolescents. *Journal of Pediatric Nursing*, 18(6), 379-388.
- Sonnaville, J.J.J., Snoek, F.J., Colly, L.P., Deville, W., Heine, R.J. (1998). Well-being and symptoms in relation to insulin therapy in Type 2 diabetes. *Diabetes Care*, 21(6), 919-924.
- Rose, M., Fliege, H., Hildebrandt, M., Schirop, T., & Klapp, B.F. (2002). The network of psychological variables in patients with diabetes and their importance for quality of life and metabolic control. *Diabetes Care*, 25(1), 35-41.
- Rose, M., Burkert, U., Scholler, G., Schirop, T., Danzer, G., & Klapp, B.F. (1998). Determinant of the quality of life of patients with diabetes under intensified insulin therapy. *Diabetes Care*, 21(11), 1876-1884.
- Rubin, R. R. (2000). Diabetes and quality of life. *Diabetes spectrum*, 13(21).

- Retrieved May 12, 2004, from <http://journal.diabetes.org/diabetesspectrum/00v13n1/pg21.htm>.
- Rubin, R.R., & Peyrot, M. (1999). Quality of life and diabetes. *Diabetes Metab Res Rev*, 15, 205-215.
- Ruggiero, L., Glasgow, R.E., Dryfoos, J.M., Rossi, J.S., Prochaska, J.O., & Orleans, C.T., et al. (1997). Diabetes self-management. *Diabetes Care*, 20 (4), 568-576.
- Sacks, D. B., Bruns, D. E., Goldstein, D. E., Maclaren, N. K., McDonald, J. M. & Parrott, M. (2002). Guidelines and Recommendations for laboratory analysis in the diagnosis and management of diabetes mellitus. *Diabetes Care*, 25(4), 752.
- Sangeam, S. (2000). *Diabetic control of adolescents and young adult with Type 1 Diabetes*. Master's thesis in Nursing Science (Adult Nursing). Faculty of Graduate Studies, Mahidol University.
- Schilling, L. S., Grey, M. & Knafl, K. A. (2002). The concept of self-management of type 1 diabetes in children and adolescents: an evolutionary concept. *Journal of Advanced Nursing*, 37(1), 87-99.
- Shinn, D., & Johnson, D. (1978). Avowed happiness as an overall assessment of quality of life. *Social Indicators Res*, 5, 475.
- Snoek, F.J. (2000). Quality of life: A closer look at measuring patients' well-being. *Diabetes Spectrum*, 13, 24
- Songer, T.J., LaPorte, R.E., Lave, J.R., Dorman, J.S., & Becker, D.J. (1997). Health insurance and the financial impact of IDDM in families with a child with IDDM. *Diabetes Care*, 20(4), 577-584.
- Spilker, B. (1996). Introduction. In B. Spilker (Ed.), *Quality of Life and Pharmacoeconomics in Clinical Trials* (2nd ed., pp.1-23). Philadelphia: Lippincott-Raven.
- Steven, J. (1996). *Applied Multivariate Statistics for Social Science*. (3th ed.). New York: Lawrance Erlbaum.
- Sugarbaker, P.H., Barofsky, I., Rosenberg, S.A., Gianola, F.J. (1982). Quality of life assessment of patients in extremity sarcoma clinical trials. *Surgery*, 91(1), 17.
- Sullivan-Bolyai, S., Deatrick, J., Gruppuso, P., Tamborlane, W. & Grey, M. (2003)

Constant vigilance: Mothers' work parenting young children with Type1 diabetes. *Journal of Pediatric Nursing*, 18(1), 22.

Taylor, S. E. (1995). *Health Psychology* (3rd ed.). New York: McGraw-Hill.

Taylor, C. B., Miller, N.H., Reilly, K.R., Greenwald, G., Cunning, D., & Deeter, A., et al. (2003). Evaluation of a nurse-care management system to improve outcomes in patients with complicated diabetes. *Diabetes Care*, 26(4), 1058.

Testa, M.A., & Simonson, D.C. (1996). Assessment of quality of life outcomes. *The New England Journal of Medicine*, 334(13), 835-840.

Tulokas, S. (2001). Diabetes in adolescence: A new approach to patient education: The problem-base learning method. Retrieved May 5, 2004, from University of Tempere, Medical School and Department of Psychology Web site: <http://acta.uta.fi>

The Diabetes Control and Complications Trail (DCCT) Research Group. (1991). Epidemiology of severe hypoglycemia in the DCCT. *Am J Med*, 90, 450-459.

The Diabetes Control and Complications Trail (DCCT) Research Group. (1994). Effect of intensive diabetes treatment on the development and progression of long-term complications in adolescents with insulin-dependent diabetes mellitus: Diabetes Control and Complications Trail. *Journal of Pediatrics*, 125, 177-188.

The Diabetes Control and Complications Trial (DCCT) Research Group. (1988). Reliability and validity of a Diabetes Quality of Life Measure for the Diabetes Control and Complication Trial (DCCT). *Diabetes Care*, 11(9), 725-732.

Toobert, D.J., Hampson, S.E., & Glasgow. (2000). The summary of diabetes self-care activities measure. *Diabetes Care*, 23(7), 943-950.

Tkacs, N. C. (2002). Hypoglycemia unawareness. *AJN*, 102(2), 34-41.

Tuchinda, C., Unachak, K., Patarakijavanich, N., Likitmaskul, S., Panamonta, O., & Chetthakul, T. (2002). The epidemiology of type 1 diabetes in Thai children. *J Med AssocThai*, 85(6), 648-652.

Young, K.J, Longman, A.J. (1983). Quality of life and persons with melanoma: A pilot study. *Cancer Nursing*, 6, 219-225.

Velasco-Whetsell, M., Coffin, D.A., Lizardo, L.M., Lizardo, M.L.V., MacDougall,

- B. J., Madayag, T. M., et al. (2000). Diabetes mellitus. In M. Velasco-Whetsell, D.A. Coffin, L.M. Lizardo, M.L.V. Lizardo, B. J. MacDougall, T.M. Madayag, et al. (Eds). *Pediatric Nursing*. (pp.461-462). New York: McGraw-Hill.
- Watkins, K. W., Connell, C. M., Fitzgerald, J. T., Klem, L., Hickey, T., & Ingersoll-Dayton, B. (2000). Effect of adults' self-regulation of diabetes on quality of life outcomes. *Diabetes Care*, 23(10), 1514.
- Wanthana, C. (2003). *Factors influencing on quality of life among patients with traumatic brain injury*. Master's thesis in Nursing Science (Adult Nursing), Faculty of Graduate Studies, Mahidol University.
- Wanthong, A. (2002). *Self-esteem, concern, and quality of life of mothers with HIV infection*. Master's thesis in Nursing Science (Maternal and Child Nursing), Faculty of Graduate Studies, Mahidol University.
- Weijman, I., Ross, W.J.G., Rutten, G.E.H.M., Schaufeli, W.B., Schabracq, M.J., & Winnubst, J.A.M. (2004). Frequency and perceived burden of diabetes self-management activities in employees with insulin-treated diabetes: relationships with health outcomes. *Diabetes Research and Clinical practice*. Retrieved August 4, 2004, from www.elsevier.com/locate/diabres.
- Welch, G. W., Jacobson, A. M., & Polonsky, W.H. (1997). The problem areas in diabetes scale. *Diabetes Care*, 20(5), 760-766.
- WHOQOL Group. (1996). What quality of life?. *World Health Forum*, 17, 354-356.
- Wolfsdorf, J.I. (1999). Improving diabetes control in adolescents. *Diabetes Care*, 22 (11), 1767-1768.
- Wolfsdorf, J. I., Anderson, B. J., & Pasquarello, C. (1994). Treatment of the child with diabetes. In C.R.Kahn & G.C.Weir. (Eds). *Joslin's Diabetes Mellitus*, (13th ed., pp. 530-551), Philadelphia: LEA & febiger.
- Wysocki, T., Greco, P., Harris, M.A., Bubb, J., & White, N.H. (2001). Behavior therapy for families of adolescents with diabetes. *Diabeteas Care*, 24(3), 441-446.
- Zhan, L. (1992). Quality of life: conceptual and measurement issue. *Journal of Advanced Nursing* 17, 795-800.
- Zavalkoff, S. R. & Polychronakos, C. (2002). Evaluation of conventional blood

glucose monitoring as an indicator of integrated glucose values using a continuous subcutaneous sensor. *Diabetes Care*, 25(9), 1603-1604.

Ziller, R. (1974). Self-other orientations and quality of life. *Social Indicators Res*, 1, 301.

กัลยา วาณิชขันธ์บัญชา. (2546). (Kanlaya Vanichbuncha, B.E.2546: 340). การใช้ SPSS for Windows ในการวิเคราะห์ข้อมูล. (พิมพ์ครั้งที่ 6). กรุงเทพฯ: บริษัทธรรมสารจำกัด.

ชนิกา ตู้จินดา(2542). (Chanika Tuchinda, B.E. 2542). โรคเบาหวานในเด็กและวัยรุ่น, ใน สุภาวดี ลิขิตมาศกุล ชนิกา ตู้จินดา และคัทลิ ชัยชาญวัฒนากุล (บรรณาธิการ), *โรคเบาหวานในเด็กและวัยรุ่น*. (พิมพ์ครั้งที่ 1, หน้า 1-7). กรุงเทพฯ : เรือนแก้วการพิมพ์.

บัญชาจักษ์ สุขเจริญ และคณะ. (2545). (Bangchang Sukcharearn et al., B.E.2545). คุณภาพชีวิตเด็กโรคเบาหวาน. *วารสารการพยาบาลกุมารเวชศาสตร์*, 2(1), 78-87.

พรศรี ศรีอภัยภูพร และคณะ. (2545). (Pornsri Sriaussadaporn et al., B.E.2545). ผลของกิจกรรมค่ายเบาหวานต่อการรับรู้สมรรถนะตนเองและพฤติกรรมการดูแลตนเองเพื่อควบคุมโรคของเด็กโรคเบาหวาน. *วารสารการพยาบาลกุมารเวชศาสตร์*, 2(1), 88-99.

สุดใจ สมิทธิการ. (2541). (Sudjai Samithikarn, B.E.2541). *คุณภาพชีวิตของเด็กวัยเรียนโรคเรื้อรัง*. วิทยานิพนธ์ปริญญาพยาบาลศาสตรมหาบัณฑิต, สาขาการพยาบาลแม่และเด็ก บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล.



APPENDIX A

Permission to Use Instrument

Dear Dr. Gary M. Ingersoll :

My name is Porntip Tachanivate. I am a graduate student in Master of Nursing Science Program, Ramathibodi School of Nursing, Mahidol university, Thailand, Currently, I am developing my thesis proposal entitled " Factors influencing quality of life of adolescents with type 1 diabetes."

Therefore, a reliable and valid QOL measurement instrument is needed to measure quality of life in Thai adolescents with type1 diabetes. From my literature reviews, I found that your instrument(DQOLY) is very relevant to my study and I would like to use and modify your instrument to be appropriate in Thai culture.

I would rally appreciate if you allow me to use your instrument in my study and I will share you the results when my study is finished.

Thank you for your consideration, I am looking forward to hearing from you.

Sincerely,
Porntip Tachanivate.

-----Original Message-----

Sent: Wednesday, March 24, 2004 4:50 AM

To: Ingersoll, Gary M.; Tacha466@hotmail.com

Subject: Web mail from Miss Porntip Tachanivate.:

Asking for permission to use DQOLY instrument.

From: Miss Porntip Tachanivate. [mailto:Tacha466@hotmail.com]

I am delighted to let you use the instrument. If I can be of further assistance please let me know. I am appending some additional information

Gary M. Ingersoll, Ph.D.
Professor, Department of Counseling & Educational Psychology
Professor, Department of Pediatrics
<http://php.ucs.indiana.edu/~ingersol/home.html>

APPENDIX B

Expert of Quality of Life for Youth

The content validity of questionnaires were determined by seven experts included:

1. Prof. Pat Mahachoklertwatana, M.D.
Director of Endocrinology Division,
Department of Pediatrics , Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.
2. Assist. Sirichai Hongsanguanrei, M.D.
Department of Psychiatry, Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.
3. Assist. Prof. Valla Tantayotai, Ph.D.
Theptarin General Hospital.
4. Assist. Prof. Renu Pookboonmee, Ph.D.
Department of Nursing, Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.
5. Miss Boonjan Wongsunoparat
Advance Practice Nurse
Department of Nursing, Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.
6. Back translator:
Assist. Prof. Punchalee Wasanasomsithi, Ph.D.
Chulalongkorn University Language Institute
BA.(Hons.), Chulalongkorn University; M.A. in Applied Linguistics,
Ph.D. in Language Education, Indiana University.
7. Compared back translated with DQOLY
Prof. Gary M. Ingersoll, Ph.D.
Department of Counseling & Educational Psychology, Department of
Pediatrics, Indiana University, USA.

APPENDIX C

Expert of Self-Care Behaviors

The content validity of questionnaires were determined by five experts included:

1. Prof. Somchit Hanucharurnkul, Ph.D.
Department of Nursing, Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.
2. Prof. Pat Mahachoklertwatana, M.D.
Director of Endocrinology Division,
Department of Pediatric, Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.
3. Assoc. Prof. Banchang Sukcharearn
Department of Pediatric Nursing, Faculty of Nursing,
Siriraj Hospital, Mahidol University.
4. Assist. Prof. Valla Tantayotai, Ph.D.
Theptarin General Hospital.
5. Assist. Prof. Jariya Witayasooporn, Ph.D.
Department of Nursing, Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.

APPENDIX D

แบบบันทึกข้อมูลส่วนบุคคล

ผู้ป่วยเด็กรายที่.....วันที่.....

โทร.....ชื่อโรงพยาบาลที่ได้รับการรักษา.....

ส่วนที่ 1. ข้อมูลส่วนบุคคลของผู้ป่วยเด็กวัยรุ่น

1. อายุ.....ปี
2. เพศ ☐ ชาย ☐ หญิง
3. ระดับการศึกษาของผู้ป่วย
☐ ไม่ได้เรียนหนังสือ ☐ ประถมศึกษา (ระบุ)..... ☐ มัธยมศึกษา
☐ ปวส./ปวช. ☐ อุดมศึกษา (ระบุ)..... ☐ อื่นๆ (ระบุ).....
4. รวมระยะเวลาการศึกษา.....ปี.....เดือน
5. ระยะเวลาความเจ็บป่วย.....ปี.....เดือน
6. อายุที่เริ่มป่วยเป็นโรคเบาหวาน.....ปี.....เดือน

ส่วนที่ 2. ข้อมูลส่วนบุคคลของผู้ดูแล

1. ท่านเกี่ยวข้องเป็น.....ของผู้ป่วย
☐ บิดา ☐ มารดา ☐ อื่นๆ (ระบุ).....
2. สถานภาพสมรส
☐ โสด ☐ คู่ ☐ หม้าย ☐ หย่าร้าง
3. ระดับการศึกษา
☐ อ่านไม่ออกเขียนไม่ได้ ☐ ประถมศึกษา
☐ มัธยมศึกษา ☐ อนุปริญญา / ปวช. / ปวส.
☐ ปริญญาตรี ☐ ปริญญาโท ☐ ปริญญาเอก
4. รายได้รวมของครอบครัว.....บาท / เดือน
5. ค่าใช้จ่ายในครอบครัวเกี่ยวกับการรักษาโรคเบาหวาน
 ค่าอินซูลิน.....บาท / เดือน
 ค่าแผ่นตรวจน้ำตาล/ แผ่นตรวจคีโตน.....บาท / เดือน
 เข็มฉีดยา/ เข็มเจาะเลือด.....บาท / เดือน

อื่นๆ(ระบุ).....บาท / เดือน รวมทั้งสิ้น.....บาท / เดือน

6. รายได้ของครอบครัว

- ☐ ไม่พอใช้จ่าย ☐ ไม่พอใช้จ่ายและมีหนี้สิน
☐ พอใช้จ่ายแต่ไม่เหลือเก็บ ☐ พอใช้จ่ายและเหลือเก็บ

7. ท่านเบิกค่ารักษาพยาบาลโดย..... (ท่านสามารถเลือกคำตอบได้มากกว่า 1 ข้อ)

- ☐ 1. สิทธิข้าราชการ / รัฐวิสาหกิจ ☐ 2. บริษัทเอกชน ☐ 3. ประกันชีวิต
☐ 4. บัตรประกันสุขภาพ 30 บาท ☐ 5.ชำระเองทั้งหมด ☐ 6. อื่นๆ (ระบุ).....

ส่วนที่ 3. ข้อมูลด้านสุขภาพ และการดูแลตนเอง

1. จำนวนครั้งของอินซูลินที่ได้รับ (ครั้ง / วัน)

- ☐ 1 ครั้ง ☐ 2 ครั้ง
☐ 3 ครั้ง ☐ 4 ครั้ง

2. การบริหารอินซูลิน

- ☐ ท่านฉีดอินซูลินด้วยตนเอง
☐ ถ้าท่านไม่ได้ฉีดอินซูลินด้วยตนเอง
 ผู้ที่ฉีดอินซูลินให้ท่านคือ (ระบุ.....)

3. จำนวนครั้งของการตรวจระดับน้ำตาลในเลือด (ครั้ง / วัน)

- ☐ ไม่ได้ตรวจเลย ☐ 1 ครั้ง / วัน
☐ 2 ครั้ง / วัน ☐ 3 ครั้ง / วัน
☐ 4 ครั้ง / วัน ☐ > 4 ครั้ง / วัน (ระบุ.....ครั้ง / วัน)

4. ท่านรับประทานอาหารว่าง.....มื้อ (ระบุมื้อ.....)

5. ท่านมีอาการของน้ำตาลต่ำครั้งล่าสุดเมื่อไหร่ (ระบุเดือน/ปี.....)

6. โรคประจำตัวอื่น ๆ นอกเหนือจากโรคเบาหวานของท่านคือ.....

7. ระดับของค่าน้ำตาลสะสม

ค่า 3 เดือนย้อนหลัง.....% (วันที่ตรวจ.....)

ค่าครั้งล่าสุด.....% (วันที่ตรวจ.....)

8. ท่านเคยเข้าร่วมค่ายเบาหวานในเด็กและวัยรุ่น.....ครั้ง

ครั้งล่าสุดเมื่อปีพ.ศ.....

9. ท่านได้รับความรู้ในการดูแลตนเองเกี่ยวกับโรคเบาหวาน

☐ ไม่เคยได้รับ

☐ เคยได้รับ จาก.....(ท่านสามารถเลือกคำตอบได้มากกว่า 1 ข้อ)

☐ แพทย์ ☐ พยาบาล ☐ นักโภชนาการ ☐ ค่ายเบาหวาน

☐ บิดามารดาที่ป่วยเป็นโรคเบาหวาน ☐ โทรทัศน์

☐ อินเทอร์เน็ต ☐ อื่นๆ (ระบุ).....

10. น้ำหนัก.....ก.ก. ส่วนสูง.....ซ.ม. (BMI =)

APPENDIX E

แบบวัดพฤติกรรมในการดูแลตนเองของวัยรุ่นโรคเบาหวานชนิดที่ 1

ส่วนที่ 1 คำชี้แจง : ข้อคำถามต่อไปนี้ถามท่านเกี่ยวกับพฤติกรรมในการดูแลตนเองในแต่ละวันของท่านในช่วง 7 วันที่ผ่านมา กรุณาใส่เครื่องหมายวงกลม (O) ลงในหมายเลขที่ตรงกับจำนวนวันที่ท่านดูแลตนเอง

ตัวอย่าง 0 1 2 ③ 4 5 6 7

ข้อที่	พฤติกรรม
1	ในช่วง 7 วันที่ผ่านมา ท่านแปรงฟันอย่างน้อยวันละ 2 ครั้ง กี่วัน 0 1 2 3 4 5 6 7
2	ในช่วง 7 วันที่ผ่านมา ขณะอาบน้ำท่านตรวจดูผื่นคัน ตุ่มฝีหนอง ตามซอกอับ เช่น รักแร้ ใต้ราวนม ขาหนีบ อวัยวะเพศ กี่วัน 0 1 2 3 4 5 6 7
3	ในช่วง 7 วันที่ผ่านมา ท่านล้างมือก่อนเจาะเลือด หรือ ฉีดอินซูลิน กี่วัน 0 1 2 3 4 5 6 7
	
	
	
16	ในช่วง 7 วันที่ผ่านมา ท่านมีการออกกำลังกายที่ใช้เวลาอย่างน้อย 30 นาที เช่น เดิน วิ่งเล่น ทำงานบ้าน กี่วัน 0 1 2 3 4 5 6 7
17	ในช่วง 7 วันที่ผ่านมาท่านออกกำลังกาย เช่น เดินแอร์โรบิก ว่ายน้ำ วิ่ง จักรยาน เล่นกีฬา เป็นต้น กี่วัน 0 1 2 3 4 5 6 7

ส่วนที่ 2 คำชี้แจง : ในช่วง 1 เดือน ที่ผ่านมาเมื่อท่านพบเหตุการณ์ดังต่อไปนี้ ท่านปฏิบัติพฤติกรรมอย่างไร ? กรุณาใส่เครื่องหมาย ✓ ลงในช่องที่ตรงกับพฤติกรรมการดูแลตนเองของท่านมากที่สุด แต่ละเหตุการณ์มีคำตอบให้เลือก 6 คำตอบได้แก่ 0 = ไม่มีเหตุการณ์ 1 = ไม่เคยทำเลย 2 = ทำนานๆ ครั้ง 3 = ทำบ้างไม่ทำบ้าง 4 = ทำเป็นส่วนมาก 5 = ทำทุกครั้งหรือทำประจำ

ข้อที่	พฤติกรรม	ไม่มี เหตุการณ์ 0	ไม่เคย ทำเลย 1	ทำ นานๆ ครั้ง 2	ทำบ้าง ไม่ทำบ้าง พอๆ กัน 3	ทำ เป็นส่วน มาก 4	ทำทุกครั้ง หรือทำ ประจำ 5
18	เมื่อท่านไม่รับประทานข้าวท่าน แลกเปลี่ยนอาหาร เช่น ขนมจีน 1 จับใหญ่ แทนการรับประทานข้าว 1 ทัพพี หรือ ขนมปัง 1 แผ่นแทนการรับประทาน ข้าว 1 ทัพพี เป็นต้น		เพราะ.....				
19	ท่านหมุนเวียนตำแหน่งที่ฉีดอินซูลิน		เพราะ.....				
20	ท่านตรวจดูการเปลี่ยนแปลงของผิวหนัง บริเวณที่ฉีดอินซูลิน เช่น เป็นไตแข็ง เม็ด นูน หรือผิวหนังเปลี่ยนสี สีแดง มีรอยข้ำ		เพราะ.....				
21							
22							
23							
24	ท่านตรวจระดับน้ำตาลในเลือดก่อนและ/ หรือหลังการออกกำลังกาย หรือเล่นกีฬา		เพราะ.....				
25	ท่านรับประทานอาหารว่างเพิ่มขึ้น ระหว่างการออกกำลังกายหนัก เช่น วายนํ้า เตะฟุตบอล เล่นเทนนิส เป็นต้น		เพราะ.....				

ส่วนที่ 3 คำชี้แจง : ในช่วง 1 เดือน ที่ผ่านมา หากท่านไม่พบเหตุการณ์ดังต่อไปนี้ ขอให้ท่านนึกย้อนไปเมื่อท่านพบเหตุการณ์ดังกล่าวว่าท่านปฏิบัติพฤติกรรมอย่างไร ? กรุณาใส่เครื่องหมาย ✓ ลงในช่องที่ตรงกับพฤติกรรมการดูแลตนเองของท่านมากที่สุด แต่ละเหตุการณ์มีคำตอบให้เลือก 6 คำตอบได้แก่ 0 = ไม่มีเหตุการณ์ 1 = ไม่เคยทำเลย 2 = ทำนานๆ ครั้ง 3 = ทำบ้างไม่ทำบ้าง 4 = ทำเป็นส่วนมาก 5 = ทำทุกครั้งหรือทำประจำ

ข้อที่	พฤติกรรม	ไม่มี เหตุการณ์ 0	ไม่เคย ทำเลย 1	ทำ นานๆ ครั้ง 2	ทำ บ้าง ไม่ทำบ้าง พอๆ กัน 3	ทำ เป็น ส่วนมาก 4	ทำทุกครั้งหรือ ทำประจำ 5
26	เมื่อท่านมีระดับน้ำตาลในเลือดสูงมากกว่า 300 มก/ดล. ท่านตรวจปัสสาวะเพื่อหาสารคีโตน		เพราะ.....				
							
							
							
37	ท่านซักถามแพทย์เกี่ยวกับการแปลผลของระดับค่าน้ำตาลเฉลี่ย ของท่านทุกครั้ง ที่ตรวจ		เพราะ.....				
38	ท่านซักถามแพทย์ถึงกำหนดการตรวจสุขภาพประจำปี เช่น การตรวจตา การทำงานของไต ไชมันในเลือด เป็นต้น		เพราะ.....				

ท่านคิดว่าการควบคุมระดับน้ำตาลของท่านอยู่ในระดับใด

☐ ดีมาก ☐ ปานกลาง ☐ ไม่ดีต้องแก้ไข

นอกจากปัญหาดังกล่าวมาข้างต้นแล้วท่านมีปัญหาในการดูแลตนเองอื่นๆ อีกหรือไม่

☐ ไม่มี

☐ มี โปรดระบุปัญหาดังกล่าว.....

APPENDIX F

แบบสอบถามคุณภาพชีวิตของผู้ป่วยโรคเบาหวาน : วัชรุ่น

คำชี้แจง : แบบสอบถามคุณภาพชีวิต เป็นคำถามที่ประกอบด้วย 3 ด้าน จำนวนทั้งสิ้น 51 ข้อ ได้แก่

1) ด้านความพึงพอใจในชีวิต จำนวน 17 ข้อ 2) ด้านการรับรู้ถึงผลกระทบจากโรคเบาหวาน จำนวน 23 ข้อ 3) ด้านความวิตกกังวลเกี่ยวกับโรคเบาหวาน จำนวน 11 ข้อ และการประเมินภาวะสุขภาพของตนเอง 1 ข้อ

ส่วนที่ 1 ด้านความพึงพอใจในชีวิต: กรุณาทำเครื่องหมาย ✓ ลงในช่องคำตอบที่ตรงกับความรู้สึกที่แท้จริงของท่านมากที่สุด โดยคำตอบในทุกๆ ข้อ ไม่มีคำตอบที่ถูกหรือผิด ข้อความแต่ละข้อมีคำตอบให้เลือก 5 คำตอบ ได้แก่ 5= พึงพอใจมากที่สุด 4= พึงพอใจมาก 3= พึงพอใจปานกลาง 2= พึงพอใจน้อย 1= พึงพอใจน้อยที่สุด

ข้อที่	ท่านรู้สึกพึงพอใจในเรื่องต่อไปนี้มากน้อยเพียงใด?	ระดับความพึงพอใจ				
		พึงพอใจมากที่สุด 5	พึงพอใจมาก 4	พึงพอใจปานกลาง 3	พึงพอใจน้อย 2	พึงพอใจน้อยที่สุด 1
1	เวลาที่ท่านใช้ไปในการดูแลตนเองเกี่ยวกับโรคเบาหวาน					
2	เวลาที่ท่านใช้ไปในการมาตรวจสุขภาพตามนัด					
						
						
16	การปฏิบัติของเพื่อนต่อตัวท่าน					
17	การที่ท่านต้องขาดเรียน/ขาดงานเนื่องจากโรคเบาหวาน					

การประเมินภาวะสุขภาพของตนเอง

เมื่อเปรียบเทียบกับเพื่อนคนอื่นๆ ที่อยู่ในวัยเดียวกัน : ท่านคิดว่าสุขภาพของท่านในขณะนี้ เป็นอย่างไร

- ☐ ดีมาก
☐ ดี
☐ ปานกลาง
☐ ไม่ดี

ส่วนที่ 2 ด้านการรับรู้ถึงผลกระทบจากโรคเบาหวาน : กรุณาทำเครื่องหมาย ✓ ในข้อที่ตรงกับ
 ความเห็นของท่าน มากที่สุด โดยคำตอบในทุกๆข้อไม่มีคำตอบที่ถูกต้องหรือผิด ข้อความแต่ละข้อมี
 คำตอบให้เลือก 5 คำตอบ ได้แก่ 1= ไม่เคยเกิดขึ้นเลย 2= เกิดขึ้นนานๆครั้ง 3= เกิดขึ้นบางครั้ง
 4= เกิดขึ้นบ่อยครั้ง 5= เกิดขึ้นตลอดเวลา

ข้อที่	ท่านรู้สึกว่าการกระทำต่อไปนี้เกิดขึ้นกับท่าน บ่อยเพียงใด?	ผลกระทบจากโรคเบาหวาน				
		ไม่เคยเกิด ขึ้นเลย	เกิดขึ้น นานๆครั้ง	เกิดขึ้น บางครั้ง	เกิดขึ้น บ่อยครั้ง	เกิดขึ้น ตลอดเวลา
		1	2	3	4	5
1	ท่านรู้สึกเจ็บปวดจากการรักษาโรคเบาหวาน เช่น การฉีดอินซูลิน การตรวจระดับน้ำตาลในเลือด					
2	ท่านรู้สึกอับอายในการที่ต้องจัดการกับอาการ ผิดปกติจากโรคเบาหวานของท่านในที่สาธารณะ					
						
						
						
22	พ่อแม่วิตกกังวลมากเกินไปเกี่ยวกับการเป็น โรคเบาหวานของท่าน					
23	ท่านรู้สึกว่าพ่อแม่ปฏิบัติตัวเหมือนตัวท่านเป็น โรคเบาหวานเสียเอง					

ส่วนที่3 ด้านความวิตกกังวลเกี่ยวกับโรคเบาหวาน: กรุณาทำเครื่องหมาย ✓ ในข้อที่ตรงกับ
 ความเห็นของท่านมากที่สุด โดยคำตอบในทุกๆข้อไม่มีคำตอบที่ถูกหรือผิด ข้อความแต่ละข้อมี
 คำตอบให้เลือก 5 คำตอบ ได้แก่ 0= ประเมินไม่ได้ 1= ไม่กังวลเลย 2= กังวลนานๆครั้ง 3= กังวล
 บางครั้ง 4= กังวลบ่อยครั้ง 5= กังวลตลอดเวลา

ข้อที่	ท่านรู้สึกว่าการณ์ต่อไปนี้ทำให้ท่าน รู้สึกวิตกกังวลบ่อยเพียงใด?	ระดับความวิตกกังวล					
		ประเมิน ไม่ได้ 0	ไม่กังวล เลย 1	กังวล นานๆครั้ง 2	กังวล บางครั้ง 3	กังวล บ่อยครั้ง 4	กังวล ตลอดเวลา 5
1	ท่านกังวลว่าจะได้แต่งงานหรือไม่						
2	ท่านกังวลว่าจะมีลูกได้หรือไม่						
3	ท่านกังวลว่าจะไม่ได้ทำงานที่ท่านต้องการ						
4							
5							
6							
7							
8							
9	ท่านกังวลว่าครูจะปฏิบัติกับท่านแตกต่าง จากเพื่อนเพราะว่าท่านเป็นโรคเบาหวาน						
10	ท่านกังวลว่าโรคเบาหวานจะเป็นอุปสรรค ต่อการทำงาน/การทำกิจกรรมต่างๆภายใน โรงเรียน เช่น การเล่นกีฬา เป็นต้น						
11	ท่านกังวลว่าโรคเบาหวานทำให้เกิดปัญหา ในการมีนัดกับเพื่อนต่างเพศหรือไปงาน เลี้ยงกับเพื่อน						

APPENDIX G

Human Subject Approval Document

๒ ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ ๑๐๑๐๐
 โทร. (๖๖-๒) ๔๑๑-๔๔๒๕, ๔๑๑-๓๒๕๓
 โทรสาร. (๖๖-๒) ๔๑๒-๑๓๗๑


มหาวิทยาลัยมหิดล
คณะแพทยศาสตร์ศิริราชพยาบาล

2 PRANNOK Rd. BANGKOKNOI, BANGKOK 10700
 TEL. (66-2) 411-1429, 411-3263
 FAX : (66-2) 412-1371

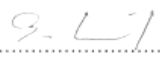
Certificate of Approval
 from
Ethics Committee Faculty of Medicine Siriraj Hospital, Mahidol University

SiEC COA No. 049/2005

Protocol Title	Factors Influencing Quality of Life of Adolescents with Type 1 Diabetes.
SiEc Protocol Number	033/2548
Principal Investigator/ Affiliation	Miss Pornip Tachanivate / Department of Nursing Faculty of Medicine Ramathibodi Hospital, Mahidol University
Research site	Siriraj Hospital
Document Approved	- Protocol - Informed consent form
Date of Approve	2 March , 2005
Date of Expiration	1 March , 2006

The aforementioned documents have been reviewed and approved by Ethics Committee, Faculty of Medicine Siriraj Hospital, Mahidol University, based on the Declaration of Helsinki.

Signature of Chairman


 (Prof. Sumalee Nimmannit)

Signature of Dean


 (Clin. Prof. Piyasakol Sakolsatayadorn)



Q001h/48

คณะอนุกรรมการพิจารณาโครงการวิจัยกรมแพทย์ทหารบก

ชั้น 5 อาคารพระมงกุฎเกล้าเวชวิทยา โรงพยาบาลพระมงกุฎเกล้าและโรงพยาบาลพระมงกุฎเกล้า
315 ถนนราชวิถี เขตราชเทวี กรุงเทพฯ 10400 โทรศัพท์ (662) 354-7600-28 ต่อ 93681

ที่...../2548

วันที่ ๒๕ มกราคม 2548

เรื่อง แจ้งผลการพิจารณาโครงการวิจัย

เรียน นางสาวพรทิพย์ เตชะนิเวศน์ คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล

ตามที่ ท่านได้ส่งโครงการวิจัย เรื่อง "ปัจจัยที่มีอิทธิพลต่อคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1" [Factors influencing quality of life in adolescents with type 1 diabetes.] เพื่อพิจารณาระเบียบวิธีวิจัยและจริยธรรมจากคณะอนุกรรมการพิจารณาโครงการวิจัยกรมแพทย์ทหารบกเพื่อประกอบการพิจารณาสนับสนุนการเก็บข้อมูล นั้น คณะอนุกรรมการพิจารณาโครงการวิจัย กรมแพทย์ทหารบก อนุมัติเมื่อวันที่ 27 มกราคม 2548 เมื่อท่านได้ทำวิทยานิพนธ์เสร็จสิ้นลง กรุณาส่งวิทยานิพนธ์ของท่าน มายังคณะอนุกรรมการ 1 ชุด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

พันเอกหญิง

(อารณภีกรมย์ เกตุปัญญา)

ประธานคณะอนุกรรมการพิจารณาโครงการวิจัย

กรมแพทย์ทหารบก



No. 21/2005

**Documentary Proof of Ethical Clearance
The Committee on Human Rights Related to
Human Experimentation
Mahidol University, Bangkok**

Title of Project. Factors Influencing Quality of Life in Adolescents with Type 1 Diabetes
(Thesis for Master Degree)

Principle Investigator. Miss Pornnip Tachanivate

Name of Institution. Faculty of Medicine Ramathibodi Hospital

Approved by the Committee on Human Rights Related to Human Experimentation

Signature of Chairman. 
(Professor Dr. Srisin Khusmith)

Signature of Head of the Institute. 
(Professor Dr. Pornchai Matangkasombut)

Date of Approval. 22 FEB 2005



คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล
ถนนพระราม 6 กทม. 10400
โทร. (662) 354-7275, 201-1296 โทรสาร (662) 354-7233
Faculty of Medicine, Ramathibodi Hospital, Mahidol University
Rama VI Road, Bangkok 10400, Thailand
Tel. (662) 354-7275, 201-1296 Fax (662) 354-7233

**Documentary Proof of Ethical Clearance Committee on Human Rights
Related to Researches Involving Human Subjects
Faculty of Medicine, Ramathibodi Hospital, Mahidol University**

No. 0386/2005

Title of Project	Factors Influencing Quality of Life in Adolescents With Type 1 Diabetes
Protocol Number	ID 01-48-06
Principal Investigator	Miss. Porntip Tachanivate
Official Address	Department of Nursing Faculty of Medicine, Ramathibodi Hospital Mahidol University

The aforementioned project has been reviewed and approved by Committee on Human Rights Related to Researches Involving Human Subjects, based on the Declaration of Helsinki.

Signature of Chairman
Committee on Human Rights Related to
Researches Involving Human Subjects


Prof. Krisada Ratana-olarn, M.D., FRCST, FICS.

Signature of Dean


Prof. Rajata Rajatanavin, M.D., F.A.C.E.

Date of Approval February 16, 2005



No.071/2005

Study Protocol and Consent Form Approval

The Ethics Committee of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand has approved the following study to be carried out according to the protocol and informed consent dated and/or amended as follows in compliance with the ICH/GCP.

Study Title : Factors Influencing Quality of Life of Adolescents with Type 1 Diabetes
Study Code : -
Centre : Chulalongkorn University
Principle Investigator : Miss Porntip Tachanivate
Protocol Date : January 11, 2005
Document Reviewed :

(Professor Anek Aribarg, M.D.)
Chairman of Ethics Committee

(Associate Professor. Vilai Chentanez, M.D.)
Associate Dean for Research Affairs

Date of Approval : February 21, 2005

Approval Expire : February 21, 2007

* A list of the Ethics Committee members (names and positions) present at the Ethics Committee meeting on the date of approval of this study has been attached. This Study Protocol Approval Form will be forwarded to the Principal Investigator.

APPENDIX H

Information Consent Form

คำอธิบายตอบแบบสอบถาม

ดิฉันนางสาวพรทิพย์ เตชะนิเวศน์ เป็นนักศึกษาหลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาการพยาบาลเด็ก คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล กำลังทำวิจัยเรื่อง “ปัจจัยที่มีอิทธิพลต่อคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1” เพื่อเป็นข้อมูลพื้นฐานในการจัดกิจกรรมเพื่อส่งเสริมและพัฒนาคุณภาพชีวิตของของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1 ดังนั้นดิฉันใคร่ขอเชิญชวนเด็กในปกครองของท่านซึ่งเป็นเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1 เข้าร่วมในโครงการวิจัยครั้งนี้ ซึ่งในขณะที่เด็กในปกครองของท่านเข้าร่วมวิจัย ผู้วิจัยจะขอให้เด็กในปกครองของท่านตอบแบบสอบถามที่ใช้ในการเก็บรวบรวมข้อมูลสำหรับการวิจัยครั้งนี้ด้วย คือแบบสอบถามข้อมูลส่วนบุคคลของท่านและเด็กในปกครองของท่าน แบบสอบถามคุณภาพชีวิตและแบบสอบถามพฤติกรรมในการดูแลตนเอง ซึ่งคาดว่าจะใช้เวลาประมาณ 30-45 นาที ในการเข้าร่วมวิจัยครั้งนี้ จะเป็นไปตามความสมัครใจของท่านและเด็กในปกครองของท่าน หากท่านและเด็กในปกครองของท่านต้องการยกเลิกการเข้าร่วมการวิจัย สามารถที่จะยกเลิกการเข้าร่วมวิจัยเมื่อไหร่ก็ได้ โดยไม่มีผลกระทบต่อค่าบริการและการรักษาพยาบาลที่เด็กในปกครองของท่านสมควรได้รับ แต่ประการใดการตอบแบบสอบถามนี้ข้อมูลที่ได้นำเสนอเป็นผลสรุปโดยรวมของผู้เข้าร่วมโครงการวิจัย หากท่านมีข้อสงสัยประการใดเกี่ยวกับแบบสอบถามในการวิจัยครั้งนี้ ดิฉันยินดีอธิบายให้ท่านและเด็กในปกครองของท่านเข้าใจอย่างชัดเจนตลอดเวลา และข้อมูลทั้งหมดจากการตอบแบบสอบถามนี้จะได้รับการปกปิดเป็นความลับ

ผู้วิจัยหวังว่าเด็กในปกครองของท่านจะได้รับเชิญเข้าร่วมโครงการและขอขอบคุณในการเข้าร่วมโครงการนี้

ลงชื่อ.....

(นางสาวพรทิพย์ เตชะนิเวศน์)

ผู้ดำเนินการวิจัย

เอกสารคำอธิบาย / คำชี้แจงแก่ผู้เข้าร่วมโครงการวิจัย

หัวข้อเรื่อง “ปัจจัยที่มีอิทธิพลต่อคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1”

วัตถุประสงค์และวิธีวิจัย

ในการวิจัยครั้งนี้ต้องการทราบข้อมูลเกี่ยวกับคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1 และปัจจัยที่มีอิทธิพลต่อคุณภาพชีวิตของเด็กโรคเบาหวานชนิดที่ 1 โดยเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1 ที่มีอายุระหว่าง 12-18 ปี ที่ได้รับเชิญเข้าร่วมโครงการจะเป็นผู้ตอบแบบสอบถามเกี่ยวกับข้อมูลส่วนบุคคล คุณภาพชีวิต และพฤติกรรมในการดูแลตนเอง ซึ่งใช้เวลาประมาณ 30-45 นาที

เหตุผลที่เชิญชวนให้เด็กในปกครองของท่านเข้าร่วมโครงการวิจัย

เนื่องจากในปัจจุบันจำนวนของเด็กและวัยรุ่นที่เป็นโรคเบาหวานชนิดที่ 1 เพิ่มขึ้น ซึ่งเด็กวัยรุ่นที่เป็นโรคเบาหวานชนิดที่ 1 ต้องมีการปรับตัวเพิ่มขึ้นเป็น 2 เท่า ต้องปรับตัวต่อการเปลี่ยนแปลงเมื่อเข้าสู่วัยรุ่นซึ่งมีเปลี่ยนแปลงด้านร่างกาย จิตใจ อารมณ์ และสังคม อย่างรวดเร็ว การปรับตัวเพื่อให้เป็นที่ยอมรับของเพื่อน ในขณะเดียวกันต้องปรับตัวต่อการมีชีวิตร่วมกับโรคเบาหวานไปตลอดชีวิต ต้องปรับเปลี่ยนวิถีชีวิต และเรียนรู้ในการดูแลตนเอง เพื่อให้สามารถควบคุมระดับน้ำตาลให้อยู่ในเกณฑ์ปกติ เพื่อป้องกันไม่ให้เกิดภาวะแทรกซ้อนทั้งเฉียบพลันและเรื้อรัง โรคเบาหวานจึงก่อให้เกิดความเครียดอย่างมากต่อผู้ป่วยและสมาชิกทุกคนในครอบครัวและกระทบต่อคุณภาพชีวิต ดังนั้นผู้วิจัยจึงมีความสนใจศึกษาปัจจัยที่มีอิทธิพลต่อคุณภาพชีวิตของเด็กวัยรุ่นที่เป็นโรคเบาหวานชนิดที่ 1 ทำให้บุคลากรที่ดูแลผู้ป่วยโรคเบาหวานในเด็กและวัยรุ่นมีความรู้ความเข้าใจเพิ่มขึ้น และสามารถเป็นข้อมูลพื้นฐานเพื่อใช้เป็นแนวทางในการวางแผนดูแลและจัดกิจกรรมเพื่อส่งเสริมและพัฒนาคุณภาพชีวิตได้อย่างเหมาะสมและมีประสิทธิภาพ

ระยะเวลาที่เข้าร่วมการวิจัย

ผู้เข้าร่วมการวิจัยจะใช้เวลาระหว่างรอพบแพทย์เพื่อตอบแบบสอบถามประมาณ 30-45 นาที

ประโยชน์ที่คาดว่าจะเกิดขึ้น

ข้อมูลที่ได้จะเป็นประโยชน์ต่อส่วนรวมเพื่อใช้เป็นแนวทางในการวางแผนจัดกิจกรรมเพื่อส่งเสริมและพัฒนาคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1

ความเสี่ยงหรือความไม่สบายใจที่อาจเกิดขึ้นกับผู้เข้าร่วมในการวิจัย

ไม่มีความเสี่ยงหรืออันตรายใดๆในการเข้าร่วมการวิจัย เนื่องจากการวิจัยครั้งนี้ไม่ได้กระทำการทดลองหรือปฏิบัติหัตถการใดๆที่มีการลุกล้ำร่างกาย แต่ในการตอบแบบสอบถามอาจไม่สะดวกและเสียเวลาบ้างประมาณ 30-45 นาที ในระหว่างรอพบแพทย์

ขอบเขตการดูแลรักษาความลับและข้อมูลต่างๆ

ผู้วิจัยจะเก็บข้อมูลไว้เป็นความลับ และข้อมูลที่เก็บรวบรวมมาได้ทั้งหมดจะเปิดเผยเฉพาะในรูปที่เป็นสรุปผลการวิจัยครั้งนี้ด้วยเหตุผลทางวิชาการเท่านั้น และผู้ที่จะสามารถรับรู้ข้อมูลเหล่านี้ นอกจากผู้วิจัยและอาจารย์ที่ปรึกษาแล้วต้องได้รับความยินยอมจากผู้เข้าร่วมการวิจัยก่อน

สิทธิในการถอนตัวออกจากโครงการวิจัย

ในการเข้าร่วมงานวิจัยครั้งนี้จะเป็นไปตามความสมัครใจของท่านและเด็กในปกครองของท่าน โดยเด็กในปกครองของท่านสามารถยกเลิกการเข้าร่วมโครงการวิจัยนี้ได้ตลอดเวลาโดยไม่มีผลใดๆต่อการบริการและการรักษาที่เด็กปกครองของท่านสมควรได้รับแต่ประการใด

กรณีมีเหตุจำเป็นหรือมีปัญหา ข้อเสนอแนะ ข้อเสนอติดต่อผู้วิจัย

นางสาวพรทิพย์ เตชะนิเวศน์

งานการพยาบาลป้องกันโรคและส่งเสริมสุขภาพ คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี

โทรศัพท์ 02-7144438 กด 1, 09-7895321

E-mail address: g4536541@student.mahidol.ac.th

หนังสือยินยอมโดยได้รับการบอกกล่าวและเต็มใจ (Inform Consent Form)

การวิจัยเรื่อง “ปัจจัยที่มีอิทธิพลต่อคุณภาพชีวิตของเด็กวัยรุ่นโรคเบาหวานชนิดที่ 1”

วันที่ให้คำยินยอมวันที่.....เดือน.....พ.ศ.....

ก่อนที่จะลงนามในใบยินยอมให้ทำการวิจัยนี้ ข้าพเจ้าและเด็กในปกครองของข้าพเจ้าได้รับการอธิบายจากผู้วิจัยถึงวัตถุประสงค์ของการวิจัย วิธีการวิจัย และประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียด และมีความเข้าใจดีแล้ว

ผู้วิจัยรับรองว่าจะตอบคำถามต่างๆที่ข้าพเจ้าสงสัยด้วยความเต็มใจ ไม่มีปิดบังซ่อนเร้นจนข้าพเจ้าพอใจ

ข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วมโครงการวิจัยครั้งนี้เมื่อใดก็ได้ และการเข้าร่วมโครงการวิจัยนี้โดยสมัครใจและการบอกเลิกการเข้าร่วมการวิจัยนี้ จะไม่มีผลใดๆต่อเด็กในปกครองของข้าพเจ้า

ผู้วิจัยรับรองว่าจะเก็บข้อมูลเฉพาะที่เกี่ยวกับตัวข้าพเจ้าและเด็กในปกครองของข้าพเจ้าเป็นความลับ และจะเปิดเผยได้เฉพาะในรูปที่เป็นผลสรุปการวิจัย การเปิดเผยข้อมูลเกี่ยวกับเด็กในปกครองของข้าพเจ้าต่อหน่วยงานต่างๆที่เกี่ยวข้อง กระทำได้เฉพาะกรณีจำเป็นด้วยเหตุผลทางวิชาการเท่านั้น

ผู้วิจัยรับรองว่าหากมีข้อมูลเพิ่มเติมที่ส่งผลกระทบต่อการศึกษา ข้าพเจ้าและเด็กในปกครองของข้าพเจ้าจะได้รับการแจ้งให้ทราบโดยไม่มีปิดบังซ่อนเร้น

ข้าพเจ้าได้อ่านข้อความข้างต้นแล้ว และมีความเข้าใจดีทุกประการ และได้ลงนามในใบยินยอมนี้ด้วยความเต็มใจ

ลงนาม.....ผู้ปกครอง/ผู้อุปการะ โดยชอบด้วยกฎหมาย

ลงนาม.....พยาน

ลงนาม.....พยาน

ในกรณีที่ผู้ปกครอง/ ผู้อุปการะโดยชอบด้วยกฎหมายของผู้เข้าร่วมการวิจัยไม่สามารถอ่านและเขียนหนังสือได้ จะต้องได้รับการยินยอมในขณะที่ยังมีสติสัมปชัญญะ และระบุข้อความไว้ตามนี้ ข้าพเจ้าไม่สามารถอ่านหนังสือได้ แต่ผู้วิจัยได้อ่านข้อความทั้งหมดในใบยินยอมนี้ให้แก่ข้าพเจ้าจนเข้าใจดีแล้ว ข้าพเจ้าจึงลงนามหรือประทับลายนิ้วแม่มือขวาของข้าพเจ้าในใบยินยอมด้วยความเต็มใจ

ลงชื่อ.....ผู้ปกครอง/ ผู้อุปการะโดยชอบด้วยกฎหมาย
(หรือประทับลายนิ้วแม่มือขวา) (ระบุความเกี่ยวข้อง.....)

ลงชื่อ.....พยาน

(.....)

ลงชื่อ.....พยาน

(.....)

APPENDIX I

Table 12 Frequency and percentage of diabetic Adolescents' self-care behaviors scores (n=102)

Self-Care behavior	0	1	2	3	4	5	6	7
- Personal hygiene								
1. ในช่วง 7 วันที่ผ่านมา ท่านทำความสะอาดปากและฟัน โดยการแปรงฟัน หรือบ้วนปากหลังรับประทานอาหารกี่วัน	2 2.0%	2 2.0%	6 5.9%	3 2.9%	8 7.8%	5 4.9%	8 7.8%	68 66.7%
2. ในช่วง 7 วันที่ผ่านมา ขณะอาบน้ำท่านตรวจดูผื่นคัน ตุ่มฝีหนอง ตามซอกอับ เช่น รักแร้ ใต้ราวนม ขาหนีบ อวัยวะเพศ กี่วัน	13 12.7%	3 2.9%	11 10.8%	7 6.9%	10 9.8%	17 16.7%	8 7.8%	33 32.4%
3. ในช่วง 7 วันที่ผ่านมา ท่านล้างมือก่อนเจาะเลือด หรือ จี๊ดอินซูลิน กี่วัน	9 8.8%	-	6 5.9%	9 8.8%	18 17.6%	8 7.8%	9 8.8%	43 42.2%
- Dietary control								
1. ในช่วง 7 วันที่ผ่านมา ท่านรับประทานอาหารในปริมาณที่เหมาะสมกับการจี๊ดอินซูลิน และกิจกรรมในแต่ละวัน กี่วัน	4 3.9%	1 1.0%	11 10.8%	18 17.6%	28 27.5%	23 22.5%	6 5.9%	11 10.8%
2. ในช่วง 7 วันที่ผ่านมา ท่านรับประทานอาหารจุกจิก เช่น ขนมขบเคี้ยว ท็อฟฟี่ ระหว่างมื้อ กี่วัน	23 22.5%	13 12.7%	29 28.4%	15 14.7%	15 14.7%	2 2.0%	2 2.0%	3 3.9%
3. ในช่วง 7 วันที่ผ่านมา ท่านรับประทานอาหารและผลไม้ที่มีรสหวานจัด เช่น น้ำหวาน ฯลฯ กี่วัน	6 5.9%	5 4.9%	21 20.6%	17 16.7%	18 17.6%	25 24.5%	4 3.9%	6 5.9%
4. ในช่วง 7 วันที่ผ่านมา ท่านรับประทานอาหารไขมันสูง เช่น หมูสามชั้น ขาหมู หนังเป็ด หนังไก่ กะทิ ฯลฯ กี่วัน	8 7.8%	7 6.9%	13 12.7%	21 20.6%	30 29.4%	13 12.7%	6 5.9%	4 3.9%
4. ในช่วง 7 วันที่ผ่านมา ท่านรับประทานอาหารหลักครบทั้ง 3 มื้อ กี่วัน	2 2.0%	-	3 2.9%	4 3.9%	10 9.8%	18 17.6%	7 6.9%	58 56.9%
5. ในช่วง 7 วันที่ผ่านมา ท่านรับประทานอาหารตรงกับเวลาที่จัดไว้กี่วัน	6 5.9%	3 2.9%	8 7.8%	10 9.8%	17 16.7%	29 28.4%	8 7.8%	21 20.6%
6. เมื่อท่านไม่รับประทานข้าว ท่านแลกเปลี่ยนอาหาร เช่น ขนมจีน 1 จั๊บใหญ่ แทนการรับประทานข้าว 1 ทัพพี หรือขนมปัง 1 แผ่น แทนการรับประทานข้าว 1 ทัพพี เป็นต้น	-	22 21.6%	42 41.2%	30 29.4%	5 4.9%	3 2.9%	-	-

Table 12 Frequency and percentage of diabetic Adolescents' self-care behaviors scores (n=102) (Continued)

Self-Care behavior	0	1	2	3	4	5	6	7
- Medication Taking								
1. ในช่วง 7 วันที่ผ่านมา ท่านฉีดอินซูลินตามเวลาที่กำหนดไว้กี่วัน	3 2.9%	-	3 2.9%	8 7.8%	12 11.8%	21 20.6%	8 7.8%	47 46.1%
2. ในช่วง 7 วันที่ผ่านมา ท่านตรวจดูลักษณะและสีของอินซูลินที่เปลี่ยนแปลงจากเดิม ก่อนเตรียมอินซูลิน	22 21.6%	5 4.9%	6 5.9%	6 5.9%	4 3.9%	7 6.9%	6 5.9%	46 45.1%
3. ท่านหมั่นเวียนตำแหน่งที่ฉีดอินซูลิน	-	-	12 11.8%	14 13.7%	34 33.3%	42 41.2%	-	-
4. ท่านตรวจดูการเปลี่ยนแปลงของผิวหนัง เช่น เป็นไตแข็ง มีผื่น หรือผิวหนังเปลี่ยนสี สีแดง มีรอยขีดในตำแหน่งที่ฉีดอินซูลิน	-	2 2.0%	19 18.6%	20 19.6%	33 32.4%	28 27.5%	-	-
5. ท่านรับประทานอาหารภายในเวลา 30-60 นาที หลังฉีดอินซูลินชนิดออกฤทธิ์สั้น และปานกลาง หรืออินซูลินแบบผสม	-	7 6.9%	19 18.6%	34 33.3%	22 21.6%	20 19.6%	-	-
6. ท่านปรับเปลี่ยนขนาดของอินซูลินให้เหมาะสมกับค่าระดับน้ำตาลในเลือดที่เปลี่ยนแปลง	-	18 17.6%	24 23.5%	16 15.7%	19 18.6%	25 24.5%	-	-
- Physical Activity (Exercise)								
1. ในช่วง 7 วันที่ผ่านมา ท่านมีการออกกำลังกายที่ใช้เวลาอย่างน้อย 30 นาที เช่น เดิน วิ่งเล่น ทำงานบ้าน กี่วัน	4 3.9%	8 7.8%	9 8.8%	15 14.7%	17 16.7%	19 18.6%	6 5.9%	24 23.5%
2. ในช่วง 7 วันที่ผ่านมาท่านออกกำลังกาย เช่น เดิน แอโรบิก ว่ายน้ำ วิ่งจักรยาน เล่นกีฬา เป็นต้น	9 8.8%	13 12.7%	10 9.8%	24 23.5%	12 11.8%	9 8.8%	4 3.9%	21 20.6%
3. ท่านตรวจระดับน้ำตาลในเลือดก่อนและ/หรือหลังการออกกำลังกายหรือเล่นกีฬา	-	69 67.6%	23 22.5%	7 6.9%	2 2.0%	1 1.0%	-	-
- Self-monitoring								
1. ในช่วง 7 วันที่ผ่านมา ท่านตรวจปัสสาวะเพื่อหาคีโตนทุกเช้า กี่วัน	97 95.1%	1 1.0%	1 1.0%	2 2.0%	1 1.0%	-	-	-
2. เมื่อท่านมีระดับน้ำตาลในเลือดสูงกว่า 300 มก./ดล. ท่านตรวจปัสสาวะเพื่อหาสารคีโตน	1 1.0%	60 58.8%	18 17.6%	12 11.8%	7 6.9%	4 3.9%	-	-

Table 12 Frequency and percentage of diabetic Adolescents' self-care behaviors scores (n=102) (Continued)

Self-Care behavior	0	1	2	3	4	5	6	7
3. ท่านตรวจระดับน้ำตาลในเลือดก่อนจิบยา	-	4	14	27	22	35	-	
		3.9%	13.7%	26.5%	21.6%	34.3%		
4. เมื่อมีอาการหิว ใจสั่น คลื่นไส้ อาเจียนมาก อ่อนเพลีย รับประทานอาหารไม่ได้ ท่านตรวจระดับน้ำตาลในเลือดดู ทันที	-	15	28	25	22	12	-	-
		14.7%	27.5%	24.5%	21.6%	11.8%		
- Problem solving								
1. ในช่วง 7 วันที่ผ่านมา ท่านสังเกตตนเองว่ามีอาการ น้ำตาลในเลือดสูง หรือไม่ เช่น กระหายน้ำ ปัสสาวะบ่อย หิวบ่อย ตาพร่ามัว อ่อนเพลีย น้ำหนักลด กี่วัน	18	11	20	20	6	9	3	15
	17.6%	10.8%	19.6%	19.6%	5.9%	8.8%	2.9%	14.7%
2. ในช่วง 7 วันที่ผ่านมา ท่านสังเกตตนเองว่ามีอาการ น้ำตาลในเลือดต่ำหรือไม่ เช่น หิว ใจสั่น ชีด เหงื่อแตก อ่อนเพลีย ไม่มีแรง กี่วัน	10	11	20	19	10	9	5	18
	9.8%	10.8%	19.6%	18.6%	9.8%	8.8%	4.9%	17.6%
3. เมื่อท่านเจ็บป่วยหรือรู้สึกมีอาการผิดปกติ เช่น มีไข้สูง ท้องเสียอย่างรุนแรง คลื่นไส้ อาเจียนมาก ปวดท้อง อ่อนเพลีย ไม่มีแรง รับประทานอาหารไม่ได้เลยหน้ามืด เป็นลม และแก้ไขด้วยตนเองไม่ได้ ท่านขอความ ช่วยเหลือจากผู้อื่น	-	1	31	15	24	31	-	-
		1.0%	30.4%	14.7%	23.5%	30.4%		
4. ในช่วง 7 วันที่ผ่านมา ท่านกินอาหารว่างก่อนนอน กี่วัน	22	3	3	13	5	9	9	38
	21.6%	2.9%	2.9%	12.7%	4.9%	8.8%	8.8%	37.3%
5. ท่านรับประทานอาหารว่างเพิ่มขึ้น ระหว่างการออก กำลังกายหนัก เช่น วัยน้ำ เตะฟุตบอล เล่นเทนนิส	-	60	20	12	8	2	-	-
		58.8%	19.6%	11.8%	7.8%	2.0%		
6. เมื่อเกิดภาวะน้ำตาลในเลือดต่ำ ท่านแก้ไขโดยรีบ รับประทานอาหาร 2-3 ก้อน หรือเครื่องดื่มที่มีรสหวาน ทันที จนกว่าอาการจะดีขึ้น	-	13	24	13	33	19	-	-
		12.7%	23.5%	12.7%	32.4%	18.6%		
7. เมื่ออาการของน้ำตาลในเลือดต่ำดีขึ้น ท่านรับประทาน อาหารจำพวกแป้ง และโปรตีน เช่น ขนมปัง 1 แผ่น หรือ แครกเกอร์ 2 แผ่น หรือนมจืด 1 กล่อง หรือ ซาลาเปา 1 ลูก หรือส้ม 1 ลูก	-	58	5	15	15	9	-	-
		56.9%	4.9%	14.7%	14.7%	8.8%		
8. เมื่อท่านต้องเดินทาง/ไปเที่ยวทัศนศึกษา หรือไปเข้าค่าย ท่านพกน้ำตาลและอาหารว่างติดตัว	-	30	10	17	15	30	-	-
		29.4%	9.8%	16.7%	14.7%	29.4%		

Table 12 Frequency and percentage of diabetic Adolescents' self-care behaviors scores (n=102) (Continued)

Self-Care behavior	0	1	2	3	4	5	6	7
- Stress management								
1. เมื่อท่านรู้สึกไม่สบายใจ ท่านทำให้ตนเองรู้สึกดีขึ้นได้ โดย	-	-	21 20.6%	22 21.6%	40 39.2%	19 18.6%	-	-
2. เมื่อท่านรู้สึกกังวลใจ ท่านระบายความรู้สึกโดยพูดคุย กับผู้อื่น (พ่อแม่ เพื่อน หรือ คนที่ไว้วางใจ)	-	3 2.9%	27 26.5%	30 29.4%	30 29.4%	12 11.8%	-	-
3. ท่านจัดการกับความเครียดของตนเองไม่ได้ ท่านขอ ความช่วยเหลือจากผู้อื่น (แพทย์ พยาบาล นักจิตวิทยา ครู หรือเพื่อน)	24 23.5%	4 3.9%	32 31.4%	16 15.7%	18 17.6%	8 7.8%	-	-
- Reducing risks of diabetes complications								
1. ท่านมารับการตรวจรักษาอย่างสม่ำเสมอทุก 2 – 3 เดือน	-	-	4 3.9%	5 4.9%	33 32.4%	60 58.8%	-	-
2. เมื่อท่านมาตรวจตามนัด ท่านปรึกษานักวิชาการทางด้าน สุขภาพ (แพทย์ พยาบาล นักโภชนา ฯลฯ) เกี่ยวกับการ แก้ไขปัญหาต่าง ๆ ในการดูแลตนเอง เช่น การปรับยา การ แก้ไขภาวะน้ำตาลในเลือดต่ำ และสูง	-	30 29.4%	20 19.6%	18 17.6%	15 14.7%	19 18.6%	-	-
3. ท่านซักถาม และเข้าใจเกี่ยวกับผลการตรวจสุขภาพอื่น ๆ เช่น ตรวจเลือดหาค่าน้ำตาลเฉลี่ย การตรวจการทำงานของไต ตรวจตา เป็นต้น	-	41 40.24	7 6.94	13 12.74	23 22.54	18 17.64	-	-
4. ท่านซักถามแพทย์ถึงการตรวจสุขภาพประจำปี	-	57 55.94	12 11.84	11 10.84	14 13.74	8 7.84	-	-

APPENDIX J

Table 13 Frequency and percentage of each Satisfaction item (n=102)

Satisfaction	Very dissatisfied	Moderately dissatisfied	Neither	Moderately satisfied	Very satisfied
1. How satisfied are you with the amount of time it takes to manage your diabetes?	2 2.0%	6 5.9%	47 46.1%	37 36.3%	10 9.8%
2. How satisfied are you with the amount of time you spend getting checkups?	1 1.0%	10 9.8%	34 33.3%	39 38.2%	18 17.6%
3. How satisfied are you with the time it takes to determine your blood sugar?	2 2.0%	10 9.8%	48 47.1%	35 34.3%	7 6.9%
4. How satisfied are you with your current medical treatment?	-	-	16 15.7%	60 58.8%	26 25.5%
5. How satisfied are you with the flexibility you have with your diet?	3 2.9%	13 12.7%	50 49.0%	23 22.5%	13 12.7%
6. How satisfied are you with the burden your diabetes is placing on your family?	8 7.8%	10 9.8%	48 47.1%	26 25.5%	10 9.8%
7. How satisfied are you with your knowledge about your diabetes?	2 2.0%	3 2.9%	35 34.3%	49 48.0%	13 12.7%
8. How satisfied are you with your sleep?	3 2.9%	2 2.0%	31 30.4%	40 39.2%	26 25.5%
9. How satisfied are you with your friendships?	-	1 1.0%	10 9.8%	46 45.1%	45 44.1%
10. How satisfied are you with your work, school, and household activities?	4 3.9%	5 4.9%	27 26.5%	39 38.2%	27 26.5%
11. How satisfied are you with the appearance of your body?	2 2.0%	5 4.9%	48 47.1%	33 32.4%	14 13.7%
12. How satisfied are you with the time you spend exercising?	1 1.0%	20 19.6%	34 33.3%	28 27.5%	19 18.6%
13. How satisfied are you with your leisure time?	-	8 7.8%	32 31.4%	36 35.3%	26 25.5%
14. How satisfied are you with life in general?	3 2.9%	3 2.9%	33 32.4%	42 41.2%	21 20.6%

Table 13 Frequency and percentage of each Satisfaction item (n=102)
(Continued)

Satisfaction	Very dissatisfied	Moderately dissatisfied	Neither	Moderately satisfied	Very satisfied
15.How satisfied are you with performance in school?	-	6 5.9%	39 38.2%	29 28.4%	28 27.5%
16.How satisfied are you with how your classmates treat you?	2 2.0%	2 2.0%	28 27.5%	44 43.1%	26 25.5%
17.How satisfied are you with your attendance at school?	11 10.8%	24 23.5%	44 43.1%	15 14.7%	8 7.8%

APPENDIX K

Table 14 Frequency and percentage of each Impact item (n=102)

Impact	All the time	often	Sometimes	Very seldom	Never
1. How often do you feel pain associated with the treatment of your diabetes?	12 11.8%	30 29.4%	44 43.1%	15 14.7%	1 1.0%
2. How often are you embarrassed by having to deal with your diabetes in public?	33 32.4%	31 30.4%	26 25.5%	12 11.8%	-
3. How often do you feel physical ill?	12 11.8%	63 61.8%	19 18.6%	8 7.8%	-
4. How often does your diabetes interfere with your family life?	32 31.4%	36 35.3%	26 25.5%	5 4.9%	3 2.9%
5. How often do you have a bad night's sleep?	51 50.0%	33 32.4%	13 12.7%	3 2.9%	2 2.0%
6. How often do you find your diabetes limiting your social relationships and friendships?	31 30.4%	34 33.3%	31 30.4%	4 3.9%	2 2.0%
7. How often do you feel good about yourself?	8 7.8%	10 9.8%	30 29.4%	35 34.3%	19 18.6%
8. How often do you feel restricted by your diet?	9 8.8%	18 17.6%	32 31.4%	28 27.5%	15 14.7%
9. How often does your diabetes keep you from driving a car?	71 69.6%	16 15.7%	11 10.8%	3 2.9%	1 1.0%
10. How often does your diabetes interfere with your exercising?	61 59.8%	22 21.6%	13 12.7%	6 5.9%	-
11. How often do you miss work, school or household duties because of your diabetes?	36 35.3%	38 37.3%	22 21.6%	4 3.9%	2 2.0%
12. How often do you find yourself explaining what it means to have diabetes?	4 3.9%	39 38.2%	31 30.4%	24 23.5%	4 3.9%
13. How often do you find that your diabetes interrupts your leisure time activities?	41 40.2%	37 36.3%	18 17.6%	5 4.9%	1 1.0%
14. How often do you teased because you have diabetes?	60 58.8%	22 21.6%	12 11.8%	5 4.9%	3 2.9%

APPENDIX K

Table 14 Frequency and percentage of each Impact item (n=102) (Continued)

Impact	All the time	often	Sometimes	Very seldom	Never
15.How often do you feel that because of your diabetes you go to the bathroom more than others?	20 19.6%	41 40.2%	27 26.5%	10 9.8%	4 3.9%
16.How often do you find you eat something you shouldn't rather than tell someone that you have diabetes?	31 30.4%	37 36.3%	22 21.6%	12 11.8%	-
17.How often do you hide from others the fact that you are having an insulin reaction?	49 48.0%	27 26.5%	18 17.6%	7 6.9%	1 1.0%
18.How often do you find that your diabetes prevents you from participating in school activities (for example, a school play, playing a sport)	59 57.8%	25 24.5%	10 9.8%	6 5.9%	2 2.0%
19.How often do you find that your diabetes prevents you from going to eat with your friends?	59 57.8%	25 24.5%	10 9.8%	4 3.9%	4 3.9%
20.How often do you feel that your diabetes will limit what job you will have in the future?	38 37.3%	24 23.5%	28 27.5%	8 7.8%	4 3.9%
21.How often do you find that your parents are too protective of you?	30 29.4%	28 27.5%	22 21.6%	14 13.7%	8 7.8%
22.How often do you find that your parents worry too much about your diabetes?	14 13.7%	34 33.3%	30 29.4%	15 14.7%	9 8.8%
23.How often do you find that your parents act like diabetes is their disease, not yours?	26 25.5%	24 23.5%	26 25.5%	13 12.7%	13 12.7%

APPENDIX L

Table 15 Frequency and percentage of each worry item (n=102)

Worry	All the time	often	Sometimes	Very seldom	Never
1.How often do you worry?	73 71.6%	13 12.7%	14 13.7%	1 1.0%	1 1.0%
2.How often do you worry about whether you will have children?	67 65.7%	18 17.6%	13 12.7%	2 2.0%	2 2.0%
3.How often do you worry about whether you will not get a job you want?	40 39.2%	34 33.3%	17 16.7%	5 4.9%	6 5.9%
4.How often do you worry about whether you will pass out?	44 43.1%	34 33.3%	16 15.7%	5 4.9%	3 2.9%
5.How often do you worry about whether you will be able to complete your education?	65 63.7%	18 17.6%	10 9.8%	6 5.9%	3 2.9%
6.How often do you worry that your body looks different because you have diabetes?	44 43.1%	39 38.2%	16 15.7%	2 2.0%	1 1.0%
7.How often do you worry that you will get complications from your diabetes?	4 3.9%	28 27.5%	41 40.2%	16 15.7%	13 12.7%
8.How often do you worry whether someone will not go out with you because you have diabetes?	73 71.6%	13 12.7%	8 7.8%	7 6.9%	1 1.0%
9.How often do you worry that teachers treat you differently because of your diabetes?	59 57.8%	20 19.6%	17 16.7%	3 2.9%	3 2.9%
10.How often do you worry that your diabetes will interfere with things that you do in school (sports, music, drama)?	52 51.0%	27 26.5%	14 13.7%	5 4.9%	4 3.9%
11.How often do you worry that your diabetes causes you to do things with friends like going on dates or going to parties?	59 57.8%	20 19.6%	14 13.7%	4 3.9%	5 4.9%

APPENDIX M

Testing Assumptions of Multiple Regression Analysis.

1. Assumptions by analyzing residuals (e):

1.1 Normal distribution

If the relationships are linear and the dependent variable is normally distributed for each value of the independent variable, then the distribution of the residuals should be approximately normal (Munro, 2001: 273). Normality of residuals can be test with statistical method by using the Kolmogorov-Smirnov test. It was found that the residuals had accepted null hypothesis ($p=.182$)(see Figure2).Therefore, the normal distribution are met.

		Unstandardized Residual
N		102
Normal Parameters(a,b)	Mean	.0000000
	Std. Deviation	18.26183779
Most Extreme Differences	Absolute	.108
	Positive	.057
	Negative	-.108
Kolmogorov-Smirnov Z		1.094
Asymp. Sig. (2-tailed)		.182

a. Test distribution is Normal.

b. Calculated from data.

Figure 2: One-Sample Kolmogorov-Smirnov Test

1.2 Linearity

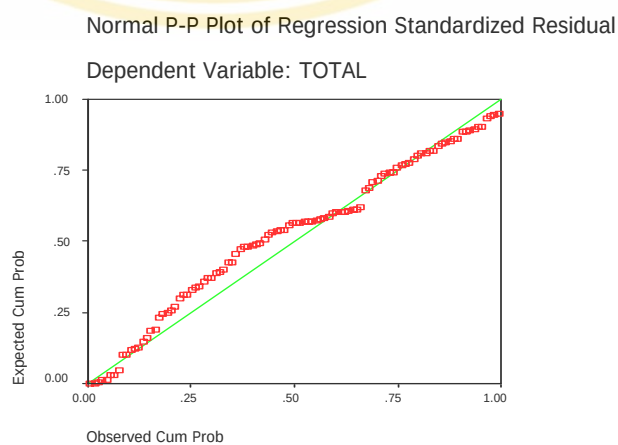


Figure 3: Normal P-P Plot of Regression Standardized Residual

Test of Assumptions (Continued)

1.3 Homoscedasticity

Homoscedasticity was tested by plotting the residuals against the predicted value and against the independent variables. For the assumption to be supported, when the standardized predictor values are plotted against the observed data values, a straight line would be formed from the lower-left corner to the upper-right corner. When the residual are from a normal distribution, the plotted valves fall close to the line in a normal probability plot (Munro, 2001: 273-274) (see Figure 4). According to the testing, the data from the study met this assumption.

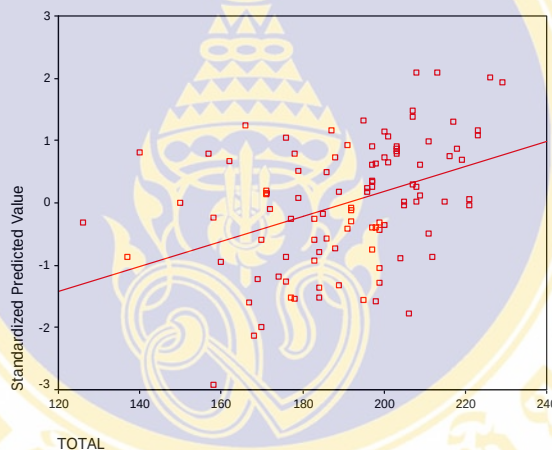


Figure 4: Scatter plot

1.3 Autocorrelations

The autocorrelations were tested by Dubin-watson test. Thus, a Dubin-watson value approaching 2 indicated that the residual was independence (Kanlaya Vanichbuncha, B.E.2546: 340). In this study, the regression model revealed a Dubin-watson test statistic of 2.304, indicated no autocorrelations problem.

2. Multicollinearity

To detect multicollinearity of variables was examined through the criteria of: 1) Pearson correlation coefficient, 2) Tolerance Value, and 3) Variance Inflation Factor

Test of Assumptions (Continued)

(VIF). As for the first criterion, intercorrelations among the independent variables were examined to determine whether multicollinearity was a problem. The gender variable was treated as dichotomous variable and entered as a dummy variable, male=1, female=0, in the analysis. A correlation matrix was used to check for large correlation coefficient >0.85 between independent variable (Munro, 2001: 271). It is found that no intercorrelations among the independent variables (gender, family income, duration of diabetes, recent HbA1C, and self-care behaviors) more than 0.85 (as shown in table7).

The second criterion, the tolerance diagnostic procedure was performed. Tolerance Value is the proportion of the variance in an independent variable that is not accounted for by the other independent variable. A Tolerance Value of zero indicated perfect collinearity (Munro, 2001: 272). In this analysis, the Tolerance Value was ranged from .938 to 1.000 (see Figure 5), reflected no multicollinearity problem.

In the third criterion, the Variance Inflation Factors (VIF) were used to detect any multicollinearity problem. The VIF were the reciprocal of tolerance. A small VIF value indicates a smaller collinearity problem. Stevens (1996: 77) suggested that, if the VIF exceed 10, it should be concern. The VIF values in this study was ranged from 1.000 to 1.066 (see Figure 5), was not exceed 10 as suggested by Stevens. Therefore, multicollinearity among the predictors was not a problem in this study.

Predictor Variable	Tolerance	VIF
1. The first equation		
Recent HbA1C	1.000	1.000
2. The second equation		
Recent HbA1C	.938	1.066
Self-care behaviors	.938	1.066

Figure 5 : Assessment for Multicollinearity among Predictor Variables in the model

BIOGRAPHY

NAME	Miss Porntip Tachanivate
DATE OF BIRTH	March, 18, 1960
PLACE OF BIRTH	Nakhonratchasima, Thailand
INSTITUTIONS ATTENDED	Mahidol University, 1978 –1983 Bachelor of Nursing Mahidol University, 2002 – 2007 Master of Nursing Science (Pediatric Nursing)
RESEARCH GRANT	Support in part by the Thesis Grant, Faculty of Graduate Studies, Mahidol University
POSITION & OFFICE	Ambulatory care Nursing Department, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, 270 Ramathibodi Hospital, Rama VI road, Rajathavee, Bangkok, Thailand Position : Registered Nurse 8 TEL: (662) 0-2201-1131.