CHAPTER 3

METHODOLOGY

In this chapter, the methodological aspects in relation to the study are presented, including the research design, population and sample. Instruments for measuring the variables are also included as well as the setting, the protection of human subjects, and data collection procedures. Finally, data analysis is presented.

Research Design

A correlational, cross-sectional research design was used in this study to examine the theoretical linkage among the variables of interest and fatigue in Thai women receiving adjuvant breast cancer chemotherapy. The variables of interest selected for this study were primarily drawn and derived from the Piper Integrated Fatigue Model (Piper et al., 1987), and the review of relevant literature as well as the researcher's empirical observation.

Population and Sample

The target population of this study was women with breast cancer who were receiving adjuvant chemotherapy. The sample was comprised of women with breast cancer receiving adjuvant chemotherapy at the short stay or day care unit in two university medical center hospitals, Bangkok, Thailand. A purposive sampling method was used to recruit the sample based on the following inclusion criteria:

1) aged 18 years and over, 2) being Buddhist, 3) being diagnosed for the first time with breast cancer and having been treated with mastectomy or lumpectomy, 4)

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

receiving at least one course of chemotherapy (CMF: Cyclophosphamide, Mthotrexate, 5-FU, CAF: Cyclophosphamide, Adriamycin, 5-FU, or AC: Adriamycin, Cyclophosphamide protocol), 5) being able to understand and communicate in the Thai language, and 6) willing to participate in this study.

Subjects who received chemotherapy concomitant with radiotherapy, and who had a history of major depression, or concurrent major health problems known to be associated with fatigue, such as cardiovascular disease, respiratory disease, or neuromuscular disease, were excluded from the study.

Sample Size Determination

The estimate of sample size is a crucial consideration in any research aimed at enhancing the reliability of population estimates. According to Cohen and Cohen (1983), sample size can be calculated from the following function:

$$n^* = L/f^2 + K + 1$$

When

n = number of sample

L = the noncentrality parameter

f^2 = effect size for regression statistics can be calculated from the squared multiple correlation coefficeient (R^2) value

$$f^2 = R^2/(1 - R^2)$$

K = the number of predictors for multiple correlation testing

Based on previous studies, they were found to indicate significant correlation between fatigue and depression (r = 0.378-0.69) (Akechi et al., 1999; Blesch et al., 1991; Dalopakarn, 2002); fatigue and nausea and vomiting (r = 0.356-0.455)

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

(Pritsanapanurungsei, 2000); fatigue and sleep disturbance (r = 0.46-0.645) (Dalopakarn, 2002; Pritsanapanurungsei, 2000); and fatigue and social support (r = -.411) (Dalopakarn, 2002). Thus, the effect size that was determined in order to maximize statistical power from previous studies is,

$f^2 = (0.356)^2 / [1 - (0.356)^2] = 0.144$

Cohen and Cohen (1983) proposed a power of .80 as reasonable for a study. From a table used to compute the noncentrality parameter with significance level of .05, power of .80, and 11 predictor variables, the L value is found to be 16.80 (Cohen & Cohen).

$n = (16.80/.144) + 11 + 1 = 128.67$

Given this criterion, a minimum of 129 subjects was necessary in this study, with 11 predictor variables.

As another criterion, Tabachnick and Fidell (1996) recommended the number of cases for testing multiple regression as $N \geq 50 + 8m$, where m is the number of predictor variables. With this method, a minimum sample size based on this rule of thumb was 138. In keeping with powerful sampling estimate, 162 subjects were recruited, which is much larger than the suggested 129 or 138, indicating an acceptable sample size.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

Setting

This study was conducted at the short stay or day care unit from two university medical center hospitals in Bangkok. These hospitals were chosen as the settings as they serve as the tertiary care centers for treatment of cancer patients with the same standardized treatment. In addition, they provide similar services for cancer

patients who receive short-term intravenous infusion chemotherapy from Monday to Friday. Both settings have televisions, magazines, and soft drinks or drinking water to serve the patients during chemotherapy treatment. At the first treatment, the oncologists and oncology nurse specialists advise patients individually about the treatment, possible side effects, how they should cope with the side effects, and provide booklets, and/ or pamphlets about disease, treatment, and self-care practices when receiving chemotherapy. During each chemotherapy administration, the oncology nurse will regularly evaluate laboratory tests and assess side effects and the patients' conditions.

Instrumentation

The instruments selected to collect data in this study were a set of questionnaires which the subjects responded to individually. Characteristics of the instruments, including number of items, format, scoring, and psychometric properties were presented. This set of questionnaires included the Patient Demographic Questionnaire, the Revised Piper Fatigue Scale (PFS), the Modified Symptom Distress Scale (MSDS), the General Sleep Disturbance Scale (GSDS), the Hospital Anxiety and Depression Scale (HADS), the Family APGAR Questionnaire, the Friend APGAR Questionnaire, and the Buddhist Practice Scale (BPS). A description of each instrument is presented as follow:

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

The Patient Demographic Questionnaire

The Patient Demographic Questionnaire was developed by the researcher for obtaining personal data and medical information. The questionnaire included both

closed-end multiple choices, and fill-in questions. It comprised of two parts. In *Part One*, subjects were asked for personal information including age, marital status, number of children, education, employment, income, sufficient income, treatment payment method, and problems of treatment payment. In *Part Two*, the researcher reviewed information related to disease and treatment of each subject, including the stage of breast cancer, type of surgical treatment, chemotherapy protocol, number of chemotherapy courses, duration of last chemotherapy, other diseases or co-morbidity, results of complete blood count test, and height and weight (see Appendix A).

The Revised Piper Fatigue Scale (PFS)

The Revised PFS developed by Piper and colleagues (1998) was used to measure subjective fatigue experience. This multidimensional instrument was adapted from the original 40-item PFS (Piper et al., 1989). Content validity of the original PFS was determined by a thorough literature review on concept and measurement of symptoms in general, and of fatigue and pain in particular, and reviewed by an 11-member national fatigue expert panel (Piper et al., 1998). Concurrent validity has been estimated in cancer patients by significant correlations between the subscale and mood disturbance scores of the Profile of Mood States (POMS) and the Fatigue Symptom Checklist (FSCL) scales and total fatigue scores (Piper et al., 1998).

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

To confirm the multidimensionality of the original PFS and to reduce the total number of PFS items, a 40-item numeric version of the original PFS was revised, based on data from part of a large cross-sectional mailed survey to 2,250 women breast cancer survivors. Only 715 (32%) surveys were returned. Of these, 382 (53%)

met the methodological study's criteria and completed of all 40 items on the original PFS (Piper et al., 1998). The final version of the PFS consisted of 22 numerically-scaled items that measure four dimensions of subjective fatigue. These dimensions have been confirmed statistically through the use of principal component factor analysis with oblique rotation. Factor loading for items on the four fatigue subscales were .528 to .953. Internal consistency reliability for the four subscales, as measured by Cronbach's alpha ranged from alphas of .92 to .96, and the standardized alpha for the entire scale (22 items) was .97 (Piper et al., 1998).

The revised PFS contains 22 items that measure four dimensions of subjective fatigue: behavioral severity (6 items), sensory (5 items), cognitive/mood (6 items), and affective/meaning (5 items). Each item is anchored by two words, for example strong or weak, and the participant was asked to circle a number from 0-10 that best describes their current fatigue experience. Total and subscale mean scores are obtained by summing the individual items of each subscale for a total score and dividing the number of items in the subscale or total score in order to keep the score on a 0 to 10 scale. A higher score means more fatigue. The score was classified into four levels, namely none (0), low (0.01-3.99), moderate (4–6.99) and high (7–10) (Piper, 2002 as cited in Dalopakarn, 2002).

Pritsanapanurungsie (2000) translated the revised PFS into the Thai language. The content validity of the revised PFS Thai version was examined by five experts; two oncologists, one oncology nurse, and two nursing instructors, who are experts in cancer care. This Thai version was tested among 10 women with breast cancer. It indicated excellent internal consistency reliability, as measured by Cronbach's alpha, ranging from .97 to .99 for the entire scales and from .88 to .99 for

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

the four subscales. This instrument was then used in a Master's thesis to describe patterns of fatigue and related factors in 30 women breast cancer patients receiving adjuvant chemotherapy in Thailand. Internal consistency reliability of this scale is .96 to .99, and four subscales range from alphas of .88 to .99 (Pritsanapanurungsie, 2000).

In this study, the revised PFS Thai version (see Appendix B) was used with the permission of the Faculty of Graduate Studies, Mahidol University (see Appendix L). The internal consistency reliability coefficient of this instrument was evaluated among women with breast cancer in this study. The reliability of the entire instrument was .95. The Cronbach's alpha coefficient obtained were .91, .96, .88, and .92 for each subscale of behavioral severity, sensory, cognitive/mood, and affective/meaning, respectively.

The Modified Symptom Distress Scale (MSDS)

The Symptom Distress Scale (SDS), a 10-item scale, was originally developed to measure the degree of discomfort associated with 10 symptoms commonly experienced by patients during cancer treatment (McCorkle & Young, 1978). Items can be used individually or as a total score of symptom distress (McCorkle & Young, 1978; McCorkle & Quint-Benoliel, 1983). The SDS was modified by the investigator in the current study to reduce subject burden and to reflect more severity than distress of nausea, and pain symptoms. In addition, the investigator added a "vomiting" item to assess the severity of this symptom, as the original SDS did not include it. Thus, the MSDS, three-item, eleven-point scale was used to indicate the severity of the physical symptoms (nausea, vomiting, and pain)

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

that patients experienced over the last week, ranging from 0 (not at all) to 10 (greatest severity) (see Appendix C).

The MSDS, severity of pain score was retrieved from the pain item score on the SDS. The severity of nausea and vomiting mean scores are obtained by summing nausea and vomiting items of the MSDS for a total score and dividing by the number of items in order to keep the score on 0 to 10. A higher score means greater severity of the symptom. The score was classified into four levels as fatigue, namely none (0), low (0.01 - 3.99), moderate (4.00 - 6.99) and high (7 - 10).

Content validity and reliability of the original SDS were determined by McCorkle and Young (1978) and showed good reliability with Cronbach's alpha of .82. In this study, the internal consistency reliability coefficient of nausea and vomiting items was .70. The reliability of the entire instrument (3 items) was .71. The reliability of the pain severity scale is not applicable because this measure is a single item.

The General Sleep Disturbance Scale (GSDS)

The perception of sleep disturbance is assessed with the General Sleep Disturbance Scale (GSDS) developed by Lee (1992). The GSDS consists of 21 items rating aspects of sleep quality and quantity in six categories. These include difficulty getting to sleep (1 item), waking up during sleep (1 item), waking up too early from sleep (1 item), quality of sleep (3 items: sleeping well, feeling rested upon waking, and feeling satisfied with sleep), quantity of sleep (2 items: too little sleep and too much sleep), fatigue and alertness during the day (7 items), and use of substances to help induce sleep (6 items). An 8-point Likert scale from 0 (never) to 7 (every day) in

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

each item is provided for respondents to rate after thinking about sleep in the past week. Total possible score ranged from 0 to 147, with 3 items of quality of sleep reverse-coded. Higher scores indicated greater sleep disturbance (Lee, 1992).

The GSDS established high internal consistency reliability (Cronbach's alpha coefficient = .88), and divergent validity was established in 760 female shift workers, of whom night and rotating workers reported significantly higher sleep disturbance scores than did permanent day and evening workers (Lee, 1992). Cronbach's alpha coefficient of the GSDS in 100 women with HIV was .80 (Lee, et al., 1999), and in 52 prostate cancer patients was .86 (Lee, Miaskowski, West, et al., 2003).

Concurrent validity has been established with the DuPuy General Well-Being Schedule vigor scale ($r = -.73$, $p < .001$) and a 100 mm visual analog scale line where respondents indicate their level of energy ($r = -.60$, $p < .001$) (Lee & DeJoseph, 1992).

For an appropriate administration of the GSDS in Thai women with breast cancer, the developer (K. Lee) gave permission to use and modify this instrument by deleting one item of the 6 items regarding using substances to help induce sleep (use marijuana to help to get sleep) because of the cultural difference (K. Lee, personal communication, August 25, 2004). Therefore, the modified version of the GSDS composed of 20 items is used (see Appendix E). It also used the 8-point Likert scale ranging from 0 (never) to 7 (every day), with a total possible score 0 to 140. It was translated into Thai by the investigator. The accuracy of the translation was verified by the back-translation procedure by two bilingual experts (see Appendix I) to maintain the content of the original items. Two language versions were reconsidered

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

and modified repeatedly until the translator and back translator agreed to its correct meaning (Hilton & Skutkowski, 2002; Jones & Kay, 1992). After correction, the Thai version was tested for internal consistency. The reliability using a standardized alpha coefficient was tested in this study, and the Cronbach's alpha obtained was .81.

The Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety and Depression Scale (HADS), a 14-item self-report questionnaire with a 4-point Likert scale developed by Zigmond and Snaith (1983), was used to measure anxiety and depression. Samples rated their feelings during the past week. It consists of a 7-item anxiety subscale and a 7-item depression subscale. Anxiety was measured by the "odd" items (1, 3, 5, 7, 9, 11 and 13), while "even" items (2, 4, 6, 8, 10, 12 and 14) measured depression.

Items 1, 3, 5, 8, 9,10, and 13 were rated from 0 "not at all" to 3 "very often or all the time." Items 2, 4, 6, 7, 11, 12, and 14 were rated from 0 for "very often" while the score of 3 is for "not at all." Therefore, the possible scores for either anxiety or the depression subscale range from 0 to 21. Total score of 11 or more on either subscale was considered to be a significant case of psychological morbidity, while total score of 8-10 represent borderline and 0-7 as normal (Zigmond & Snaith, 1983). The HADS is appropriate to use because it contains no items referring directly to feelings of tiredness or sleepiness, which are most likely to be confounded with a fatigue questionnaire.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

The HADS was translated into Thai by Nilchaikovit and others (1996). Validity and reliability of the Thai HADS was tested in 60 cancer patients. Responses from the Thai HADS were evaluated against the semi-structural clinical review.

Results from factor analysis demonstrated that there were two factors that included most of the items about anxiety and depression subscale. The internal consistency for both subscales reported by Cronbach's alpha coefficient was .855 for anxiety sub-scale, and .825 for depression subscale (Nilchaikovit et al., 1996). In brief, the Thai HADS was a valid and reliable instrument for measuring anxiety and depression. Therefore, the Thai HADS was used in the study (see Appendix E). The reliability using a standardized alpha coefficient was tested in Thai women with breast cancer in the present study, and the Cronbach's alpha obtained was .74 for anxiety subscale, and .71 for depression subscale.

The Family APGAR Questionnaire

The Family APGAR Questionnaire is a brief questionnaire developed by Smilkstein (1978) to test five areas of family functioning as nurturing and supporting: adaptability, partnership, growth, affection, and resolve/commitment. This 5-item questionnaire was used to measure perceived family support because it was easy to administer, and the questions used minimal words (Swain & Harrigan, 1994). In the original version, scores for each item ranged from 0 to 2, "hardly ever," "some of the time," and "almost always," respectively. Smilkstein and colleagues (1982, 1993) mentioned that the 3-point scale is appropriate use for screening for family functioning. For research purposes, however, Smilkstein (1993) and colleagues (1982) recommended that a 5-point scale should be used to obtain greater discriminant power: 0 = never, 1 = hardly, 2 = some of the time, 3 = almost always, and 4 = always. Therefore, in this study, the 5-point scale of the Family APGAR

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

Questionnaire was used. The total score ranged from 0 to 20. A higher score demonstrates greater perceived family support.

Validity of the Family APGAR Questionnaire was established using Pless and Satterwhite's (1973) Family Functioning Index and evaluated by social workers and psychologists (as cited in Malathum, 2001). Regarding reliability, the 5-point scale obtained a high Cronbach's alpha of .90 for 65 older persons (Fink, 1995). The Family APGAR, 5-point scale was translated into Thai by Malathum (2001), and was used in a sample of Thai older adults indicating a good reliability with Cronbach's alpha of .91. The Family APGAR Thai version was used in this study (see Appendix F). The reliability using a standardized alpha coefficient was tested in the current study, and the Cronbach's alpha obtained was .78.

The Friend APGAR Questionnaire

The Friend APGAR Questionnaire was developed by Smilkstein and collegues (1982) to assess five areas of friend support. The item contents and choice format are analogous to those in the Family APGAR, but the source of support is friends instead of family. The 5-point scale of the Friend APGAR Questionnaire was used. Total scores range from 0 to 20. A higher score demonstrates greater perceived friend support.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

Construct validity of the Friend APGAR Questionnaire has been established in 297 college students that showed significant difference in the mean score on the Family APGAR Questionnaire and on the Friend APGAR Questionnaire (Smilkstein et al., 1982). Malathum (2001) translated this questionnaire into Thai, and reported reliability of Cronbach's alpha .94. The Friend APGAR Thai version was used in this

study (see Appendix G). The reliability using a standardized alpha coefficient was tested in the current study, and Cronbach's alpha obtained was .84.

The Buddhist Practice Scale (BPS)

The Buddhist Practice Scale (BPS) was developed by the investigator. To obtain a measurement that could reflect in Thai culture, the investigator developed the BPS from both inductive and deductive processes.

For the inductive process, the in-depth interviews included eight informants who were four breast cancer patients, two leukemia patients and two lung cancer patients, all of whom were women and Buddhist. The guided questions for interviewing were, 1) What do you believe about cancer that relates to your religion? and 2) What do you practice that relates to your religious beliefs that you have mentioned and are its results? All interviews were tape-recorded and transcribed verbatim for analysis.

In the deductive process, the concept of Buddhist practice regarding the 10 blessings of life (the Bunya Kiriya Watdhu 10) and coping with cancer research studies were reviewed.

The inductive and deductive data were synthesized through content analysis. Data obtained were categorized into 3 categories including Dana or giving, Sila or the precepts, and Bhavana, moral/mental development. Twenty-one items were generated in the initial pool of items.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

The BPS was arranged on a 5-point Likert scale indicating the frequency of religious practices during cancer chemotherapy (see Appendix H). Ratings were indicated as 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. The total

possible scores ranged from 0 to 84. The higher score showed the greater practice of Buddhist teaching.

The content validity of the BPS was examined by a panel of five experts to confirm the representativeness of the concept. The expert panel comprised of one nurse specialist in oncology and palliative care, three academics who had experience in performing research related to Buddhism, and one who was an expert in instrument development (see Appendix J).

The expert reviewers were asked to rate each item's clarity and its relevance, as well as whether the concept had been adequately covered by the set of items. All panel experts rated each item as either quite relevant or highly relevant (the score of 3 or 4 from a 4-point rating scale) to the corresponding concept. It, therefore, met the criteria for judgment of content validity (Lynn, 1986). The content validity index (CVI) for each pair of the experts was computed. The CVI for each pair of experts ranged from .81 to 1, and the CVI of the RPS was .92 (see Appendix K), which is an acceptable value (Waltz, Strickland, & Lenz, 1991). Minor revision for appropriate wording of items suggested by the panel experts was done. The items representing each subscale of the BPS are as follows: Dana comprised of items 1 to 7; Sila comprised of items 8 to 14; and Bhavana comprised of items 15 to 21, respectively.

The Buddhist Practice Scale was tested among 10 women with breast cancer to assess the clarity of the questions and the time it took the respondents to complete, and to determine the internal consistency of the instrument. Results revealed that it was easy to answer and took only 5 minutes to complete. The Cronbach's alpha of .87 was obtained for the total 21-item scale indicating acceptable reliability (DeVellis,

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

1991). The Cronbach's alpha was .80, .68, and .75 for Dana, Sila, and Bhavada subscales, respectively.

In summary, the reliability coefficients (Cronbach's alpha) of the scales used in this study ranged from .68 to .96 (see Table 3-1). Polit and Hungler (1995) stated that reliability coefficients in the proximity of .70 may be sufficient although there is no absolute standard to determine what an acceptable reliability coefficient should be. Therefore, the reliability coefficients of the scales used in the present study ranged from acceptable to high, except Sila Subscales of Buddhist Practice Scale (.68).

Protection of the Human Subject

Prior to data collection, approval was obtained from the Human Research Review Committee of the Faculty of Nursing, Chiang Mai University; Ramathibodi Hospital, Faculty of Medicine, Mahidol University; and King Chulalongkorn Memorial Hospital, Faculty of Medicine, Chulalongkorn University (see Appendix M).

Participants were informed about the study purposes and the time required for participation. More importantly, the participants were assured that they could discontinue participation of the study at any time, simply by stopping or omitting to answer the questions uncomfortable for them, and their decision to discontinue participation would not affect the treatment or service they would receive from the hospital. The confidentiality of their answers was kept by using code numbers instead of their names. All data were reported in aggregate form. Written information and the researcher's address and phone numbers were also provided. The women willing to participate were asked to sign a consent form (see Appendix N).

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

Table 3-1

Reliability Coefficient of the Instruments Used in the Study (N = 159)

Scales	Number of Items	Alpha Coefficient
Modified Symptom Distress Scale	3	.71
Pain Scale	1	NA
Nausea/Vomit Scale	2	.70
Family APGAR Scale	5	.78
Friend APGAR Scale	5	.84
Sleep Disturbance Scale	20	.81
Hospital Anxiety Depression Scale	14	.83
Anxiety Subscale	7	.74
Depression Subscale	7	.71
Buddhist Practice Scale	21	.87
Dana Subscale	7	.80
Sila Subscale	7	.68
Bhavana Subscale	7	.75
Fatigue	22	.95
Behavior/Severity Subscale	6	.91
Affective/Meaning Subscale	5	.92
Sensory Subscale	5	.96
Cognitive/Mood Subscale	6	.88

Note: NA = not applicable because this measure has a single item

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

Data Collection Procedures

Following approval of the Human Research Board Committee of the Faculty of Nursing, Chiang Mai University, Ramathibodi Hospital, and the King Chulalongkorn Memorial Hospital, data collection procedures were initiated as follows:

1) The researcher approached the head nurse and staff of the day care or short stay service, and gave information about the study and data collection.

2) While waiting for chemotherapy administration, eligible participants were approached and given an explanation of the study by the researcher. Those willing to participate were asked to give either oral or written consent, and were advised of their right to confidentiality as well as the right to withdraw from the study at any time without penalty or effect on their treatment.

3) After informed consent was obtained, the participant was instructed to complete the Patient Demographic Questionnaires, the SDS, the PFS, the GSDS, the HADS, the Family APGAR, the Friend APGAR, and the BPS, respectively.

4) The Medical Review Record Form was used to record clinical and laboratory information including stage of breast cancer, type of surgical treatment, chemotherapy protocol, number of chemotherapy courses, duration of last chemotherapy, other diseases or co-morbidity, complete blood count, height and weight. Hemoglobin level was routinely obtained on the day of each chemotherapy treatment. Height was obtained on the day receiving the first course of chemotherapy and was used to calculate body surface area as well as chemotherapy dose. Weight was obtained on the day of each chemotherapy treatment using the same scale at the out-patient clinic to calculate the BMI.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

5) Data collection was arranged as follows: First, participants were asked to complete the Patient Demographic Questionnaire. Second, participants were requested to complete the package of questionnaires within approximately 30 to 50 minutes as follows: The SDS, the PFS, the GSDS, the HADS, the Family APGAR, the Friend APGAR, and the BPS, respectively. Moreover, data collection was obtained on Days 7 after receiving any course of chemotherapy and between 10:00 am and 2:00 pm to control circadian rhythms that may affect fatigue, except those who received CAF or AC for every 21 day cycle. These participants were advised to answer the package of questionnaires at home on Day 7 post administration chemotherapy between 10:00 am and 2:00 pm (the researcher indicated the exact date and time on the questionnaire). Then these participants brought the package back to the researcher on the next visit. There were 42 (26.4%) participants who answered the questionnaire at home.

6) The completeness of each questionnaire was examined. Participants received a thank-you for her contribution of time and meaningful information.

7) All questionnaires were coded for statistical analysis.

Procedures for Data Analysis

All data obtained from questionnaires were analyzed by using the SPSS 10.0 program and EQS 6.1 program. The overall level of significance was set at the alpha of .05. SPSS version 10.0 was used for data analysis of descriptive statistics. EQS 6.1, a structural equation modeling program, was used for path analysis with several statistical techniques presented as follows:

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

Descriptive statistics including frequency, percentage, range, mean, and standard deviation were used to delineate characteristics of the sample and examine the distribution of the variables of interest in this study.

A testing of the assumptions underlying multivariate analysis for the structural equation model and relationships among variables was conducted. Three critical assumptions, normality, linearity, and multicolinearity were conducted before multivariate analysis (Hair, et al., 1998; Munro, 1997).

A proposed model was specified, its parameters estimated, and its fit was tested. The covariance matrix was used for the causal modeling analysis. The EQS 6.1 program provided maximum likelihood (ML) estimates for all model parameters (Bentler, 1995; Bentler & Wu, 1995; Chou & Bentler, 1995). Although ML was developed under the multivariate normality assumption, it is quite robust to the violation of normality (Bentler, 1995; Byrne, 1994; Chou & Bentler, 1995). Therefore its estimates are good even when the data is not normally distribution (Schumacker & Lomax, 1996). The robust statistics refer to the Satorra-Bentler scaled test statistic, and the robust standard errors. The Satorra-Bentler scaled test statistic (S-B $\chi 2$) is "designed to have a distribution that is more closely approximated by $\chi 2$ than the usual test statistic" (Bentler, 1995, p. 47). That is, it was corrected for nonnormality (Byrne, 1994).

Then the proposed model was trimmed using standard procedures, including examination of the multivariate Lagrange Multiplier (LM) test for reducing restrictions on the model and the Wald test for dropping free parameters. The LM test points to fixed parameters that should be estimated and the Wald test indicates an overfitted model where formally free parameters could be fixed without significantly

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

eroding the overall data-model fit (Bentler, 1995; Mueller, 1996). Moreover, variables were retained in the trimmed model if they met the criteria of meaningfulness (Pedhazur, 1982).

Testing the fit of the hypothesized full model was evaluated according to the $\chi 2$ statistic, the normed fit index (NFI), nonnormed fit index (NNFI), and comparative fit index (CFI). Good fit is indicated by a non-significant $\chi 2$ (Bentler, 1995). However, the $\chi 2$ test is not sufficient to evaluate the adequacy of the fit model because of the sample size issue. When the sample size is very large, typically above 200, the specified model is more likely to be rejected although the difference between the sample variance matrix and the fitted model is small (Mueller, 1996; Munro, 1997).

Other fit indices are used that are less dependent on sample size; specifically, the CFI, NFI, and NNFI (Bentler, 1995; Schumacker & Lomax, 1996). Concerning the value of each of these indices, the CFI and NFI ranged from 0 to 1, while the NNFI could be outside this range, with values greater than or equal to .90, indicating a good fit (Bentler, 1995; Hoyle, 1995).

In addition, in another fit index, the root mean square error of approximation (RMSEA) was also used to evaluate model fit. Its value of less than .05 is an indicator of a good fit model (Raykov & Marcoulides, 2000; Schumacker & Lomax, 1996) (see Table 3-2).

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

Table 3-2

The Goodness-of-Fit Indices used in this study

Fit Index	Possible Range	Indicator of Acceptable Fit
Probability of Scaled χ^2	0 – 1	> .05
CFI	0 – 1	> .90
NFI	0 – 1	> .90
NNFI	0 – 1	> .90
RMSEA	0 – 1	< .05

Note: CFI = Comparative Fit Index
NFI = Nonmed Fit Index
NNFI = Non-Normed Fit Index
RMSEA = Root Mean Square Error of Approximate

Moreover, the path coefficients and squared multiple correlations (R^2) were estimated to determine the variance in fatigue explained by influencing factors through analysis. Standardized path coefficient was used as an estimate of a structural effect. Standardized coefficient enables the researcher to compare the effects of independent variables on dependent variables by the same unit in the same model, not for the same variable across different groups. Beta (β) was used as a structural effect of an endogenous variable on another endogenous variable. Gamma (γ) represents the structural effect of an exogenous variable on another endogenous variable (Mueller, 1996). Further, in path analysis, there are three types of structural effects: direct, indirect, and total effects. Total effects = Direct effects + Indirect effects (Bollen, 1989). These structural effects were presented.

In summary, this chapter presented research methodologies including design, population and sample, instruments, and data analysis procedures. It also included the protection of human subject, description of the instrument development, and testing of the instruments' reliability.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved