พฤติกรรมป้องกันวัณโรคของผู้ป่วยวัณโรคปอดในจังหวัดศรีสะเกษ ประเทศไทย: แบบจำลองสมการเชิงโครงสร้างของการศึกษาภาคตัดขวาง

นฤมล สิงห์ดง ปร.ด.*

บทคัดย่อ

การวิจัยนี้มีจุดมุ่งหมายเพื่อตรวจสอบความตรงของแบบจำลองสมการเชิงโครงสร้างของปัจจัยที่เชื่อมโยงกับพฤติกรรมการป้องกันวัณโรค ซึ่งครอบคลุมปัจจัยระดับบุคคล ครอบครัว และชุมชน ของผู้ป่วยวัณโรคปอด โดยผสมผสาน Transactional Model of Stress and Coping, Family Adaptation Model และ McMaster Model of Family Functioning เป็นกรอบแนวคิดการวิจัย ข้อมูลที่ใช้ในการศึกษานี้ส่วนใหญ่เก็บรวบรวมข้อมูลด้วยการสัมภาษณ์โดยใช้แบบสอบถาม จากกลุ่มตัวอย่างผู้ใหญ่ที่ป่วยเป็นวัณโรคปอดในเขตชนบท จังหวัดศรีสะเกษ จำนวน 200 คน วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา การวิเคราะห์ความสัมพันธ์ของเพียร์สัน และสถิติทดสอบสมมติฐาน ได้แก่ สถิติวิเคราะห์เส้นทางอิทธิพล และสถิติการวิเคราะห์โมเดลสมการโครงสร้าง (Structural Equation Modeling : SEM)

ผลการวิจัยพบว่า แบบจำลองสมการเชิงโครงสร้างของพฤติกรรมการป้องกันวัณโรค มีความตรงเชิงโครงสร้างหรือมีความสอดคล้องกับข้อมูลเชิงประจักษ์ที่รวบรวมจากกลุ่มตัวอย่าง และแสดงให้เห็นว่าระดับของความเครียด/ความต้องการ มีความสัมพันธ์กับการเพิ่มขึ้นของระดับการประเมินความสำคัญของวัณโรค การให้คุณค่าต่อพฤติกรรมการป้องกันวัณโรค และความพยายามในการรับมือกับความเครียดและความต้องการของครอบครัว นอกจากนั้นยังพบว่าการเพิ่มขึ้นของพฤติกรรมการป้องกันวัณโรคมีความสัมพันธ์กับการให้คุณค่าต่อพฤติกรรมการป้องกันวัณโรค และความพยายามของครอบครัวในการรับมือกับความเครียดและความต้องการอันเกิดจากการเจ็บป่วยด้วยวัณโรค ทั้งนี้ตัวแปรระดับบุคคลและระดับครอบครัวร่วมกันอธิบายความแปรปรวนของพฤติกรรมการป้องกันวัณโรคได้ร้อยละ 45.8

ผลการศึกษานี้ จึงชี้แนะให้ทีมสุขภาพส่งเสริมความพยายามหรือความอุตสาหะของครอบครัวในการรับมือกับปัญหา และยกระดับการให้คุณค่าต่อพฤติกรรมการป้องกันวัณโรค เพื่อสนับสนุนให้ผู้ป่วยมีพฤติกรรมการป้องกันวัณโรคที่ดีขึ้น อันจะส่งผลดีต่อการควบคุมวัณโรคต่อไป

คำสำคัญ: วัณโรคปอด พฤติกรรมป้องกันวัณโรค ปัจจัยด้านครอบครัว แบบจำลองสมการเชิงโครงสร้าง

Introduction

Tuberculosis (TB) is a major global health problem especially in low income countries. In 2012, 8.6 million cases of TB were notified to national TB programmes (NTPs)[1]. The majority of cases worldwide in 2012 were in the South-East Asia (29%), African (27%) and Western Pacific (19%) regions. Of these cases, 5.7 million were people newly diagnosed in 2012 and 0.4 million were previously diagnosed TB patients whose treatment regimen was changed. An estimated 1.1 million (13%) of the 8.6 million people who developed TB in 2012 were HIV-positive. Moreover, 6% of the global totals were children under 15 years of age. Globally, 1.4 million deaths were reported[1]. TB deaths among HIV-negative children was reported to be 8% of the global totals. By 2012,

* อาจารย์ สำนักวิชาพยาบาลศาสตร์ มหาวิทยาลัยเทคโนโลยีสุรนารี

the TB mortality rate had been reduced by 45% since 1990[2]. With the treatment success rate of 87% among all new TB cases was slightly over 85% of the global target, an estimated 3.6% of newly diagnosed TB cases and 20% of those previously treated for TB were reported to have MDR-TB in 2012. According to the 2013 Global report[2], notification of TB case in 2012 represented only 66% of real cases. This statistic showed that NTPs would face significant challenges in keeping TB under control.

Pulmonary TB morbidity in Thailand is high and continues to rise due in part to the influence of HIV and AIDS. Since 1999, Thailand has been identified as one of the 22 high-burden countries for TB, based on case notifications and treatment outcome data supplied to the WHO by NTPs[3]. Recently, the 2012 all-form TB incidence in Thailand was estimated to be 119 cases per 100,000 population, as compared to 122 cases per 100,000 population globally. The overall case detection rate in Thailand exceeded the target of 70% (76%), treatment success was 79% in 2013, well below the global target of 85%[2]. The low treatment success rate is due mainly to patients who died while on treatment (11%) or those who defaulted or were transferred between treatment centers without subsequent follow-up of treatment outcome (13%)[4]. In 2010, the prevalence of about 209 new cases per 100,000 population were reported in Sisaket, despite the high treatment success rate of 90.02% in 2008[4]. Interplay among biological, psychological, sociocultural, socioeconomic, and structural factors affect TB related behaviors, the dynamics of TB transmission, and TB control[5]. The major control strategy, however, relies on treatment campaigns aimed at encouraging patient compliance. Moreover, such campaigns have not always been 100% effective causing high incidence and prevalence for years. In addition, prevention strategies to benefit persons who have had close contact with a TB patient, despite their important, have received limited attention[4]. Studies have validated interrelationships and influences between patient adjustment and family members[6,7]. One study found that families with members who are cancer patients faced several illness related demands, which negatively correlated with the level of family adaptation[8]. To date, limited studies examining family factors that influence TB preventive behaviors among Thai population have been found.

This study tested hypotheses linking family stress, appraisal of TB, appraisal of TB prevention, family functioning, family coping efforts, and TB preventive behaviors in order to examine a predictive model for TB preventive behaviors. The model presents the ways in which individual and family contexts influence these variables. The model was tested using data collected with 200 TB patients for the author's dissertation entitled, "Family adaptation after a recent diagnosis of pulmonary TB of a household family member". The study focused on a group of TB patients residing in the Sisaket province of Thailand.

Definitions

TB Appraisal refers to TB patient evaluation of the significance of the TB illness. The primary appraisal was measured with perceived TB severity and motivational relevance. *Perceived severity* is an individuals' subjective perception regarding the seriousness of pulmonary TB and its consequences. Perceived severity is a positive attribute of preventive behaviors. *Motivational relevance* is a relationship between personal intents, goals, and motives (issues the person care about). Motivational relevance involves selection of several alternative interpretations indicating the course of action to be adapted. When TB is perceived as having a major impact on a person's goals, that person is likely to experience situation-specific distress, especially when the relevance is to one's own physical health and wellbeing[9].

TB Prevention appraisal is the TB patients' evaluation of coping resources and options with respect to the stress of the TB diagnosis. This appraisal shows distinct associations with negative emotions. Prevention appraisal includes family resource for management, perceived control over outcomes, and efficacy beliefs. *Perceived control over TB* takes into account which coping options are available and the likelihood that a given coping option will accomplish its aim.

Family functioning refers to the organizational properties of a family group and the patterns of transactions among family members to reconfigure roles, responsibilities, and pattern of support in order to accommodate member(s) with TB illness and the psychosocial needs of the entire family.

Coping efforts are actual strategies used by individuals and families to intervene in response to primary and secondary appraisals to reduce the effects of demands and stressors (TB illness) on family functioning and subsequent behaviors. Coping efforts are undertaken when a patient or family tries to manage the condition and maintain normal life. Coping strategies are typically divided into two types: emotion-focus coping and problem-focused coping. When most stressful events occur, emotion-focused and problem-focused coping are used in combination. The degree to which each type of coping is used depends mainly on the appraised stressfulness of the situation.

TB preventive behaviors are protective activities performed by TB patients to keep family members well in the case of a new diagnosis of pulmonary TB in the family. The behaviors include the use of personal protective equipment such as masks and gloves and general precautions including hand washing, disinfection, and patient containment. Additional TB preventive behavior includes covering the nose and mouth when coughing.

Theoretical model

The theoretical model was derived from the Transactional Model of Stress and Coping (TMSC), the Family Adaptation Model (FAM), and the McMaster Model of Family Functioning (MMFF)[9-11]. Constructs selected from the TMSC are primary appraisal, secondary appraisal, and adaptation (health behaviors). Constructs derived from the FAM are appraisals, social support, and coping efforts. Constructs derived from the MMFF are family functioning and coping efforts. Stress/demand is a common construct found in all three theories. The synthesized framework is logical as it shares similar concepts across the models and is appropriate to address the questions of interest.

The TMSC specifies a tripartite process of cognitive appraisals, emotional responses, and efforts to cope with stressors[9]. The FAM characterizes how demands/stressors affect family adaptation through family coping processes[12]. These processes involve parental use of personal and social supports and are directed by global and specific appraisals of their unique situation.

The MMFF was developed based on the assumption that the primary function of family unit is to provide a setting for the development and maintenance of family members on the social, psychological, and biological levels[13]. Consequently, this assumption emphasizes that (1) the parts of the family are interrelated; (2) one part of the family cannot be understood by isolation from the rest of the system; (3) family functioning cannot be fully understood by simply understanding each of the parts; (4) a family's structure and organization are important factors determining behavior of family members; and (5) transactional pattern of the family system changes the behavior of family members[13]. The MMFF focuses on six dimensions of the family including affective involvement, affective responsiveness, roles, communication, behavior control, and problem solving.

The framework of the proposed model characterizes how demands/stressors affect adaptation through family functioning and coping efforts. When faced with a stressor, a person evaluates the potential threat (primary appraisal) as stressful, positive, controllable, challenging or irrelevant. Facing a stressful event, the person assesses his/her coping resources and options; the so called *secondary appraisal*[14].

Secondary appraisals address what one can do about the situation. Actual *coping efforts* aimed at regulation of the problem give rise to *outcomes* of the coping process. This process involves the use of personal and social supports and is directed by global and specific appraisals of their situation. Family coping is seen as the process of using these supports and appraisals to reduce the effects of demands and stressors on family functioning and subsequent adaptation. A patient's adaptation to TB affects treatment adherence and subsequent treatment outcome. One assumption of this model is that adaptation is an ongoing process used by the family in response to demands and stressors of varying magnitude and intensity. The process moves from left (antecedences) to right (coping outcomes). When satisfactory adaptation is attained, the cycle reiterates back to the beginning involving a consideration of new demands or stressors on family capabilities. Unsatisfying or difficult adaptations can lead to prolonged physiological and psychological instability of family members affecting patient outcomes[15].

The author examined a model that focused on three dependent variables: perception of TB, prevention appraisal, and TB preventive behaviors (see Figure 2). Figure 2 present the paths in the structure model.

Methods

Subjects

The sample for this study is comprised of residents of Sisaket province who were: (1) newly diagnosed with pulmonary TB within the three months prior to data collection, (2) at least 18 years old, and (3) able to communicate verbally. An individual was excluded from the study if he or she had a known psychiatric disorder. Additionally, TB patients with known HIV comorbidity were excluded from the study due to confidentiality issues.

Potential research participants were identified using district TB staff. The staff contacted patients meeting study selection criteria and asked them to consider participation in the study and for permission to provide their information to the researcher. TB clinic staff provided contact information of each TB patient who verbally agreed to participate in the study to the researcher. Prospective subjects were contacted by the investigator to schedule home visit appointments. During visits to the patients' homes, a member of the research staff explained the study to potential subjects, invited them to participate, obtained consent, and interviewed the patient.

A sample of 200 subjects was recruited and interviewed by the author and trained interviewers. An incentive of 100 Baht (approximately $2.5) was paid to each respondent. The mean age of the participants was 55 years (*SD = 15.14*) with 61.4% (124) men. Among all subjects, 17.8% (36) were TB contacts. Ninety five percent of this sample was rice farmers. In terms of education, 6.9% (14) has no school education, 86.1% (174) has some years in primary school (Grades 6 or less), 1.5% (3) attended middle school, 3% (6) has high school education, 0.5% (1) has some college education, 0.5% (1) has completed four years of college, and 0.5% (1) has completed more than four years of college.

Measures

Most data used in this analysis were collected with 200 TB patients of Sisaket Province. A structured paper and pencil questionnaire consisting of

147 items was completed using personal interviews. The questionnaire includes items from several scales. The Family Stressor tool was used to assess family demands/stressors. Family functioning was assessed using the Family Assessment Device. The TB Interview Instrument was used to measure perceived severity of TB. Motivational Relevance Index was used to measure motivational relevance. The TB Self-efficacy scale mesures efficacy belief. The Family Inventory of Resources for Management and perceived control over TB question were used to measure perceived control over TB preventive behaviors. The Family Coping Index was used to assess family coping efforts. TB Preventive Behavior Inventory was used to assess individual TB preventive behaviors. These data were collected after the completion of TB treatment. All tools were developed and tested to be used in the author's previous study[16]. Alpha reliabilities of tool varied from .57 to 92.

Analytic Strategy

The role of stress/demand and family functioning and their influence on TB appraisal, prevention appraisal, family coping, and TB preventive behaviors are illustrated as a structural model (see Figure 2). This model was tested by a confirmatory structural equation modeling (SEM) analysis using EQS program. The SEM analysis provides simultaneous estimation of the hypothesized regressions using the covariance matrix generated on the basis of the observed covariance matrix of the variables measured. The estimated covariance matrix is also used for evaluating the goodness-of-fit between the data and the model. Six cases were skipped from the analysis because a variable is missing. Therefore, 191 of the present sample size (*N=200*) was used as the actual *N* in the EQS procedure.

The structure model for analysis included a latent variable model specified next. The latent variable stress/demand was indicated by the mean scores of the FSI. Financial functioning was indicated by the means of FAD-general Function and FAD-role subscales obtained from the family functioning measure. Scale means of the FIRM, TBSES, and perceived control over TB prevention measures served as the three indicators for the TB prevention appraisal construct. The three scale means of the FAMCI subscales were used to indicate family coping. Lastly, TB Preventive Behaviors were indicated by two subscales created from the 10-item measure of TB preventive behaviors.

Special procedures were applied to handle the *Perceived Control over TB* variable. A robust estimation procedure provided by the EQS software was used to correct for the effects of non-normality of the results. Additionally, Satorra-Bentler adjustment to the chi square statistic was used since the data analyzed are not multivariate normal. Modifications were made based on Wald test for dropping parameters and Lagrange Multiplier test for adding parameters.

In reporting the results of SEM, the author followed the guidelines suggested by Raykov, Tomer, and Nesselroade (1991)[17] and provided three goodness-of-fit indices: Normed Fit Index (NFI), Nonnormed Fit Index (NNFI), Comparative Fit Index (CFI), and one misfit measure: root-mean square error of approximation (RMSEA). Fit indices that exceed .90, and a RMSEA that is .06 or below, are indicative of an acceptable model fit[18]. Parameter estimates from the standardized solution were reported.

Results

The estimated correlation among the latent factors was presented in Table 2. The measurement model has a reliability coefficient (Cronbach's Alpha) of .275. An exploratory factor analysis reveals that several indicators loaded poorly on the factors (see Table 3). Given the very low Cronbach's Alpha and poor factor loading, modifications were made to correct this problem. Measurement error of the believed

efficacy scale was correlated with the error of the FIRM. The measurement error of the FAMCI-family confident was correlated with the error of the FAMCI-family and friend subscale. These modifications increase Cronbach's Alpha to an acceptable level (.502). Consequently, the estimated measurement model has acceptable goodness-of-fit indices [*Satorra-Bentler Scaled* X^2 (101, N 191) = 244.416, p < .001; NFI = .852; NNFI = .853; and CFI = .904] and the RMSEA of .086. Additional modifications were made to improve model fit. However, these additional modifications did not provide a better result. Therefore, the model from the acceptable measurement model was used to estimate paths and test the structure model discussed below.

The Structure Model: The Relationships of Stress/Demand and Family Functioning on TB Appraisal, Prevention Appraisals, Family Coping, and TB Preventive Behaviors

The structural model that was examined addresses the subsequent set of hypotheses:

1. Stress/Demand is associated with an increase in TB appraisal, family coping efforts, as well as an increase in TB prevention appraisals.

2. Family functioning has a positive relationship with family coping efforts and TB preventive behaviors. When a family is well function, it makes better efforts to cope with problems and engages in desire TB preventive behaviors than a family that functions poorer.

3. TB appraisal has a positive relationship with TB preventive behaviors and family coping efforts. Individuals who have high levels of perceived TB appraisal have better preventive behaviors than those whose level of perception is lower.

4. TB prevention appraisals have a positive relationship with family efforts to cope with TB illness and TB preventive behaviors. When a person perceives that TB prevention would be beneficial to the family wellbeing, he or she will put more efforts to engage in TB preventive behaviors.

5. Family coping effort has a positive relationship with TB preventive behaviors.

The EQS program encountered difficulties in the initial estimation process. The condition code message specified that some measurement errors being constrained at lower bound. Consequently, the particular errors were constrained to the smaller values. The estimated structure model with constrained errors the following fit indices: Satorra-Bentler Scaled X^2(117, N 194) = 16.965, p = .000; NFI = 1.000; NNFI = 1.000; CFI = 1.000; and RMSEA = .000. The goodness-of-fit indices that equal to 1 and a misfit measure that equals to zero indicate that the model fit perfectly to the data. Although significant Chi-square value of the model indicates lack of satisfactory model fit, a judgment for model fit in this study does not rely solely on this measure since it is very sensitive to a study sample size. Therefore, no further modifications were made to improve the Chi-square. Parameter estimates obtained from the original structure model were presented below.

The Figure 3 presents the paths in the structure model. The figure shows that stress/demand was negatively associated with family functioning (r = -.49). As expected, stress/demand was statistically correlated with an increase in TB appraisal (β= 149), family coping efforts (β= 166) and TB prevention appraisal (β= 164). The overall model explained 45.8% of the variance in TB preventive behaviors.

Other parameter estimates reveal that family functioning has a weak relationship with family coping efforts (β= -.129) and with TB preventive behaviors (β= -.061). The parameter estimates are negative due to the fact that the indicators were scaled to have a lower score indicating a better family function. Therefore, the

results concluded that the functional family has better family coping efforts and TB preventive behaviors. However, the results show no statistically significant differences between the degree of family functioning on the respective dependent variables.

TB appraisal has a negatively weak relationship with TB preventive behaviors (β= -.028). This finding does not support the hypothesis 3, which is proposed that individuals who have high levels of perceived TB appraisal have better preventive behaviors than those whose level of perception is lower. However, the relationship explained only 2.2% of the variances in TB appraisal. On the other hand, the TB appraisal has a significant positive relationship, although weak, with family coping efforts (β= -.237).

Statistically significant relationships were found between the degrees of TB prevention appraisals on the respective dependent variables. TB prevention appraisals have a positively strong relationship with family efforts to cope with TB illness (β= .518). Moreover, TB prevention appraisals have a positive relationship with TB preventive behaviors (β= .362). In addition to TB prevention appraisals, family coping effort also has a positive relationship with TB preventive behaviors (β= .362).

Discussion and Conclusions

The purpose of this study is to examine a model of how individual and family variables affect TB preventive behaviors of people recently diagnosed with pulmonary TB residing in rural Thai communities. The findings conclude that TB preventive behaviors construct has a positive relationship with family coping and TB prevention appraisal. The family coping efforts construct was statistically correlated with stress/demand, an increase in TB appraisal, and TB prevention appraisal. This relationship explained 41.8% of the variance in family coping efforts. Additionally, the relationships between stress/demand and TB appraisal, and TB prevention appraisal, although significant and positive, explained only 2.2% and 2.7% of the variances in TB appraisal and TB preventive appraisals, respectively.

The structural equation model under study could not reject hypotheses 1, 2, 4, and 5. Several studies indicate the importance of the family availability of resources and the use of coping strategies[11,19,20]. Data from this study suggest that increases in stress/demands are a significant contributor to family coping efforts.

TB appraisal has a negatively weak relationship with TB preventive behaviors. This finding is inconsistent with the theoretical underpinnings of the study and may reflect the nature of the crisis, characteristics of the sample, or timing of data collection in the study. An explanation for this finding remains to be determined.

Family coping efforts may reduce the impact of increases in stress/demand on family adaptation, which are TB preventive behaviors in this study. This finding is consistent with the results of studies on family members who provide care to elderly parents[21].

Results of this analysis show that this model does not fit the data very well. This poor fit may due to the reasons discussed below. The first problem encounters factor loadings of indicators in the measurement model. Several indicators loaded poorly on the same factors, despite the fact that most measurements, alone, have good reliabilities. The measurement model, although has several acceptable fit indices, has construct reliability of .275, much lower than the conventional reliability of at least .70 for the factor loadings. This low alpha may be because of lack of homogeneity of variances among indicators.

The next concern regards the numbers of observation used in this model testing. For a model with over ten variables, sample size under 200 generally

means parameter estimates are unstable and significance tests lack power[22]. To compute the asymptotic covariance matrix, one needs k(k+1)/2 observations, where k is the number of variables[23]. This model testing has 6(6+1)/2 = 21 observations implying that including more subjects may provide better results.

The potential value of the theoretical underpinnings used in this study is evident. Although this descriptive study cannot claim that TB prevention appraisals have a direct effect on family coping efforts and TB preventive behaviors, it is logical to consider this effect on the dependent variables in the population under study. The findings should be replicated with a design that can indicate causal effect of the independent variables on the respective dependent variables and a bigger sample size.

The findings for the model investigated in this study offer some implications for the design of preventive interventions for TB control. To improve TB preventive behaviors, intervention should focus on addressing two important issues: enhancing family coping efforts and increasing positive appraisals for TB prevention. Helping families develop a plan for coping with difficulties families of the patients encountered would include priorities for requesting assistants from family, friends, professional providers, and spirituality, as well as inquiring confident within one's own family. Developing strategies to cope with stress and demand could give families the skill to handle their undesirable situations.

TB prevention appraisals can be addressed by increasing coping resources, enhancing efficacy belief in preventive behaviors as well as personal expectation to gain control over the outcome (TB control). The similar coping resources have been found to increase the strength of job search behavior[24] and family capabilities on adaptation after critical injury[15,25]. An improvement in TB preventive behaviors, in turn, will improve an adherence to TB treatment plan and treatment outcome.

References

1. World Health Organization. Global Tuberculosis Report 2012. World Health Organization; 2012.
2. World Health Organization. Global tuberculosis report 2013. World Health Organization; 2013. Report No; WHO/HTM/TB/2013.11.
3. Singha-Dong N, Wongkri K. Tuberculosis Disparity in High Burden Province of Thailand. The International Journal of Tuberculosis and Lung Disease 2012;16(12): 373.
4. Singha-Dong N, editor. Barriers to Tuberculosis (TB) control of communities with poverty and high TB incidences, regardless of high treatment success rates. The 43rd Union World Conference on Lung Health; 2012. Nov 13-17, 2012; Kuala Lumpur Convention Centre, Malaysia: The International Journal of Tuberculosis and Lung Disease (IJTLD).
5. Shrestha-Kuwahara R. Anthropological contributions to TB research and control 2002 [database on the Internet]. 2013[cited 2002 July 23]. Available from: www.cdc.gov/nchstp/tb/notes/TBN_2_02/U_reb.htm.
6. Compas BE, Worsham NL, Epping-Jordan J, Grant K, Mireault G, Howell DC, et al. When mom or dad has cancer: makers of psychological distress in cancer patients, spouses, and childeren. Health Psychology; 1994. p.13:507-15.
7. Northouse L, Dorris G, Charron-Moore C. Factors affecting couples' adjustment to recurrent breast cancer. Social Science & Medicine; 1995. p.41:69-76.
8. Packard NJ, Haberman MR, Woods NF, Yates BC. Demands of illness among chronically ill women. Western Journal of Nursing Research 1991;13(4): 434-57.
9. Lerman C, Glanz K. Stress, Coping, and Health Behavior. In: Glanz K, Lewis FM, Rimer BK, editors. Health behavior and health education: Theory, research, and practice. 2 ed. San Francisco:

Jossey-Bass; 1996. p. 113-38.
10. McCubbin HI, Thompson AI. Family stress theory and assessment: The T Double ABC Model of family adjustment and adaptation. In: McCubbin HI, Thompson AI, editors. Family assessment inventories for research and practice. Madison, WI: University of Wisconsin-Madison; 1987. p. 3-32.
11. McCubbin MA, McCubbin IH. Families coping with illness: The resiliency model of family stress, adjustment and adaptation In: Danielson C, Hamel-Bissell B, Winstead-Fry P, editors. Families, Health and Illness. New York: Mosby; 1993.
12. McDonald L, Kysela G, Drummond J, Martin C, Wiles W. Assessment of the Clinical Utility of a Family Adaptation Model 2005[database on the Internet]. 2013 [cited 2005 March 24]. Available from: http://www.quasar.ualberta.ca/cfrrp/famadap.html.
13. McCubbin H, McCubbin M. Family System Assessment in Health Care. In: McCubbin HI, Thomson AI, editors. Family assessment inventories for research and practice. Madison: University of Wisconsin-Madison; 1987. p. 52-78.
14. Cohen MS. Famlies coping with childhood chronic illness: a research review. Families, Systems & Health 1999;17(2):149-64.
15. Leske J, Jiricka M. Impact of family demands and family strengths and capabilities on family well-being and adaptation after critical injury. Am J Crit Care. 1998 October 1 1998;7(5):383-92.
16. Singha-Dong N. Family adaptation after a recent diagnosis of pulmonary tuberculosis of a household family member in Sisaket Province, Thailand. [Dissertation]. Ann Arbor, MI: University of Michigan; 2007.
17. Raykov T, Tomer A, Nesselroade JR. Reporting structural equation modeling results in psychology and aging: Toward a proposition of publication guidelines Psychology and Aging ;1991. p. 6:499-503.
18. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling 1999;6(4):1-55.
19. McCubbin MA. Family stress and family strengths: a comparison of single- and two-parent families with handicapped children. Res Nurs Health; 1989. p.12:101-10.
20. Woods NF, Haberman MR, Packard NJ. Demands of illness and individual, dyadic, and family adaptation in chronic illness. West J Nurs Res; 1993.p.15:10-30.
21. Fink SV. The influence of family resources and family demands on the strains and well-being of caregiving families. Nurs Res 1995;44(3):139-46.
22. Loehlin JC. Latent variable models: An introduction to factor, path, and structural analysis. 2 ed. Hillsdale, NJ: Lawrence Erlbaum; 1992.
23. Fan X, Thompson B, Wang L. Effects of sample size, estimation method, and model specification on structural equation modeling fit indexes. Structural Equation Modeling 1999(6):56-83.
24. Vinokur AD, Price RH, Caplan RD. Hard times and hurtful partners: How financial strain affects depression and relationship satisfaction of unemployed persons and their spouses. J of Personality and Social Psychology 1996; 71(1):166-79.
25. Leske JS. Needs of adult family members after critical illness: prescriptions for interventions. Critical Care Nursing Clinics of North America 1992; 4(4): 587-96.

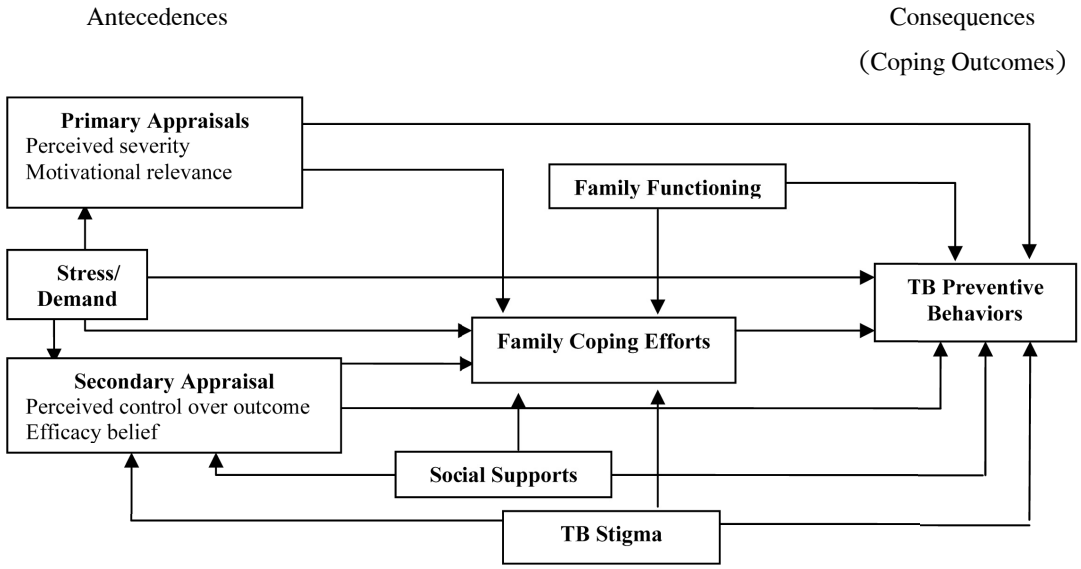

Figure 1 Theoretical Model of TB Preventive Behaviors[16]

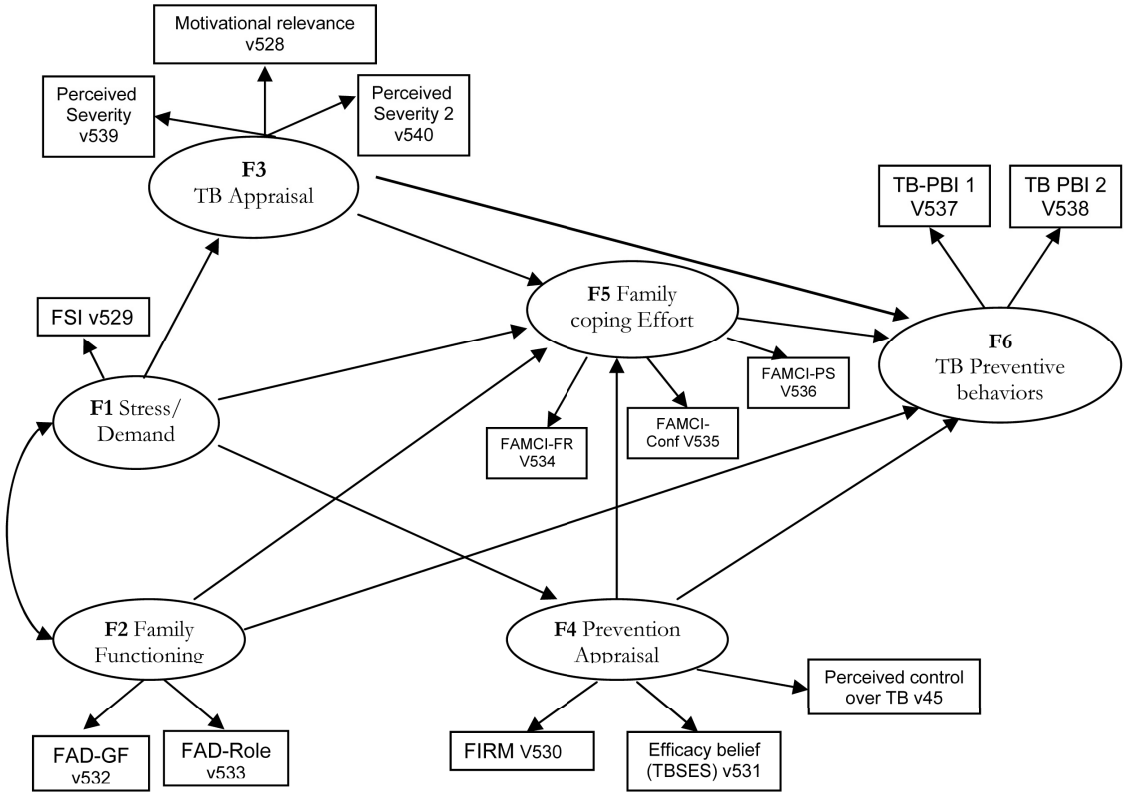

Figure 2 Theoretical Model of Relationships of Family and Individual Context on TB Preventive Behaviors

Table 1 Product − Moment Correlations among all measurement variables (Indicators) that were used in the Structural Model and their Means and Standard Deviations

Measured variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Perceived severity 1[a]	1.000													
2. Motivation relevance	.187	1.000												
3. Perceived severity 2[b]	.712	.250	1.000											
4. Family stress	.054	.076	.155	1.000										
5. Family resources for management	−.084	.128	−.024	.174	1.000									
6. Belief efficacy	−.118	.126	−.083	.058	.457	1.000								
7. Perceived TB control	−.015	−.013	−.115	−.074	.155	.336	1.000							
8. Family functioning−general function	.173	−.027	.183	−.047	−.470	−.519	−.301	1.000						
9. Family functioning−role	−.015	−.095	−.054	−.051	−.373	−.344	−.197	.407	1.000					
10. FAMCI−family, friend	.050	.111	.181	.304	.294	.180	−.179	−.095	−.103	1.000				
11. FAMCI−confident in family	−.082	.026	−.098	.005	.548	.557	.284	−.583	−.409	.147	1.000			
12. FAMCI− professional, spiritual	.122	.259	.225	.252	.409	.281	−.183	−.157	−.278	.624	.352	1.000		
13. TB preventive behaviors 1[a]	.165	.148	.136	.130	.184	.284	.066	−.185	−.226	.106	.188	.249	1.000	
14. TB preventive behaviors 2[b]	.016	.079	.014	.175	.393	.333	.012	−.253	−.220	.348	.333	.471	.392	1.000
Mean	4.595	4.886	4.565	6.959	2.520	4.136	3.910	1.811	2.409	3.440	4.140	3.358	3.932	3.855
SD	0.639	0.228	0.575	7.573	0.537	0.519	0.957	0.413	0.322	1.113	0.885	1.041	0.708	0.695

Note: FAMCI = Family Coping Efforts.

[a] and [b] indicate subindices of the respective construct. Each subindex is based on half on the items that were used to measure the construct.

Table 2 Estimated correlation among the latent factors

Latent Factors	1	2	3	4	5	6
F1. Stress/Demand	-					
F2. Family Functioning	-0.047					
F3. TB appraisal	0.149	-0.045				
F4. TB Prevention Appraisals	0.056	-0.354	-0.081			
F5. Family Coping	0.235	-0.285	0.228	0.296		
F6. TB Prevention	0.206	-0.34	0.072	0.466	0.561	-

Table 3 Factor loadings of indicators of Stress/Demand, Family Functioning, TB appraisal, TB Prevention Appraisals, Family Coping, and TB Prevention

Construct	Indicator	Factor loading
Stress/Demand	FSI	1.00
Family Functioning	FAD-General Functioning	.414
	FAD-Role	.996
TB appraisal	TII perceived severity 1	.539
	MRI	.263
	TII perceived severity 2	.999
TB Prevention Appraisals	FIRM	.465
	TBSES	.998
	Perceived control over TB	.337
Family Coping Efforts	FAMCI-family friend	.614
	FAMCI-family confident	.339
	FAMCI-professional spiritual	1.00
TB Preventive Behaviors	TBPBI 1	.512
	TBPBI 2	.780

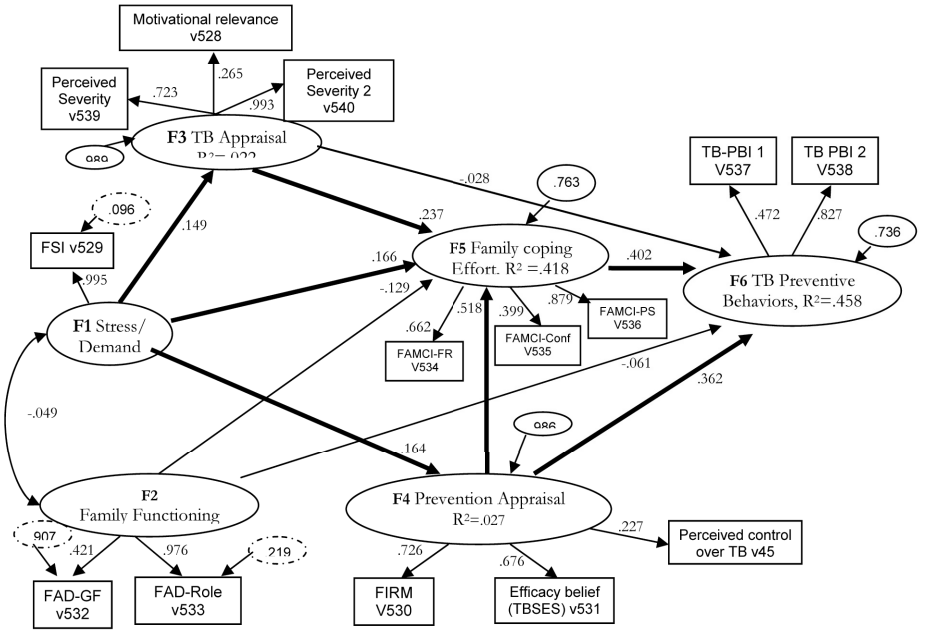

Figure 3 Structural equation model of the relationships of stress/demand and family functioning on TB appraisal, TB prevention appraisals, family coping, and TB preventive behaviors: $X^2(117, N\ 194) = 16.965$, p = .000; NFI = 1.000; NNFI = 1.000; CFI = 1.000; and RMSEA = .000). Solid and thin lines represent statistically significant (p <.05) and non significant paths, respectively. Curved two-headed arrows represent correlation between independent variables. Numbers inside the small circles are residual variances. Numbers inside the small broken circles are measurement standard errors.

Tuberculosis Preventive Behaviors of a Patient with Pulmonary TB in Sisaket Province of Thailand: A Structural Equation Model of a Cross-sectional Survey

Naruemol Singha-Dong PhD*

Abstract

This article examines the process linking individual and family variables to tuberculosis (TB) preventive behaviors of people newly diagnosed with pulmonary TB using structural equation modeling. The author tested the model in which stress/demand is associated with an increase in TB appraisal, family coping efforts, and TB prevention appraisals; the quality of family functioning is associated with family coping and TB preventive behaviors; TB prevention appraisals is associated with an increase in family coping efforts and TB preventive behaviors; and family coping effort is associated with TB preventive behaviors. The dependent variables are perception of TB, prevention appraisal, family function, and TB preventive behaviors. A structured paper and pencil questionnaire was used to collect data from 200 TB patients in rural Thailand through personal interviews. Data were analyzed using descriptive statistics, Pearson product-moment correlation, path analysis, and Structural Equation Modeling (SEM). The model showed an acceptable good fit for the sample. The results demonstrated that level of stress/demand was associated with an increase in TB appraisal, TB prevention appraisal, and family coping efforts. An increase in TB preventive behaviors was correlated to TB prevention appraisals and family coping efforts. The overall model explained 45.8% of the variance in TB preventive behaviors. Results suggest that TB preventive behaviors can be improved by promoting family coping efforts and enhancing TB prevention appraisals.

Keywords: Pulmonary Tuberculosis, preventive behavior, family factor, structural equation model

* *Lecturer, Institute of Nursing, Suranaree University of Technology*