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Research Paper

Integrating Buddhist Teachings with Health Education: A Mixed-Methods Research and Development Study of the Buddhist Instruction Model for Diabetes Risk Prevention in Northeastern Thailand[1]

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Abstract:

Background: Diabetes prevalence in northeastern Thailand has reached critical levels, with traditional health education approaches showing limited effectiveness in promoting sustainable behavioral change. Buddhist teachings, deeply embedded in Thai culture, offer untapped potential for culturally-relevant health interventions that address both physical and psychological aspects of chronic disease prevention.

Purpose: This study aimed to develop and evaluate the effectiveness of a Buddhist Instruction Model (BIM) for diabetes risk prevention, integrating core Buddhist principles with evidence-based health education among at-risk populations in northeastern Thailand.

Methods: A mixed-methods Research and Development (R&D) approach was employed across four phases in three northeastern provinces (Khon Kaen, Roi Et, and Maha Sarakham). The quantitative component involved 364 participants aged 35-65 years at risk of developing diabetes, while the qualitative component included 48 key informants (healthcare professionals, Buddhist monks, and community leaders). The BIM integrated the Four Noble Truths, Four Requisites, and Four Foundations of Mindfulness with modern diabetes prevention strategies. Data collection utilized validated questionnaires, semi-structured interviews, focus group discussions, and physiological measurements. Statistical analyses included descriptive statistics, paired t-tests, and multiple regression analysis using SPSS 28.0.

Results: Post-intervention analysis revealed significant improvements in diabetes knowledge scores (pre: M=12.4, SD=3.2; post: M=18.7, SD=2.8; $t(363)=24.31$, $p<0.001$, Cohen's $d=2.1$), health behavior adoption rates increased by 67% ($p<0.001$), and HbA1c levels decreased significantly (pre: M=6.2%, SD=0.8; post: M=5.7%, SD=0.6; $t(363)=8.94$, $p<0.001$). Qualitative findings revealed strong cultural alignment and enhanced motivation for sustained behavioral change. The model demonstrated 78% effectiveness in preventing progression to prediabetes at 6-month follow-up.

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Conclusions: The Buddhist Instruction Model represents a culturally-grounded, evidence-based approach to diabetes prevention that successfully integrates spiritual wisdom with modern health science. This research provides a scalable framework for implementing culturally-sensitive health interventions in Buddhist-majority populations and contributes to the growing body of knowledge on integrative approaches to chronic disease prevention.

Keywords: Buddhist instruction model, diabetes prevention, mindfulness-based intervention, cultural health education, northeastern Thailand, mixed-methods research

1. INTRODUCTION

Diabetes mellitus has emerged as one of the most pressing public health challenges in Southeast Asia, with Thailand experiencing a particularly rapid increase in prevalence over the past two decades (Aekplakorn et al., 2021). The northeastern region of Thailand bears a disproportionate burden of this epidemic, with diabetes prevalence rates reaching 8.9% in 2021, significantly higher than the national average of 7.2% (Thai Ministry of Public Health, 2022). This disparity reflects complex interactions between genetic predisposition, dietary transitions, urbanization patterns, and limited access to culturally-appropriate health education resources (Sirikul et al., 2020).

Traditional biomedical approaches to diabetes prevention, while scientifically sound, often fail to achieve sustained behavioral change in Thai communities due to their disconnection from cultural values and belief systems (Wongcharoen et al., 2021). The northeastern region, known as Isan, maintains strong Buddhist traditions that profoundly influence worldview, lifestyle choices, and health-seeking behaviors (Phuengsamran et al., 2020). Buddhism, practiced by over 95% of the Thai population, offers a comprehensive framework for understanding suffering, cultivating mindfulness, and promoting ethical living that remains largely untapped in contemporary health promotion efforts (Rattanamongkolgul et al., 2019).

Recent advances in integrative medicine have demonstrated the efficacy of mindfulness-based interventions in chronic disease management, with Buddhist meditation practices showing particular promise in diabetes care (Sharma et al., 2021). However, most existing research has focused on isolated mindfulness techniques rather than comprehensive integration of Buddhist philosophical principles with evidence-based health education (Zhang et al., 2020). This gap represents a significant missed opportunity to develop culturally-resonant interventions that leverage Thailand's rich spiritual heritage for public health benefit.

The development of culturally-grounded health interventions requires sophisticated understanding of how traditional wisdom systems can be authentically integrated with modern scientific knowledge without compromising either domain's integrity (Napier et al., 2020). Buddhist teachings, particularly the Four Noble Truths, Four Requisites (Sappāya), and Four Foundations of Mindfulness (Satipaṭṭhāna), provide practical frameworks for understanding the causes of suffering and pathways to well-being that align remarkably well with contemporary health promotion principles (Bodhi, 2020).

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This research addresses the critical need for innovative, culturally-appropriate diabetes prevention strategies by developing and evaluating a comprehensive Buddhist Instruction Model (BIM) that systematically integrates core Buddhist teachings with evidence-based health education. By conducting this research in the northeastern provinces of Thailand, where both diabetes burden and Buddhist cultural influence are strongest, this study aims to contribute significantly to the growing field of culturally-grounded health interventions while providing practical solutions for one of Thailand's most pressing public health challenges.

2. LITERATURE REVIEW

2.1 Diabetes Burden in Northeastern Thailand

The northeastern region of Thailand faces a particularly severe diabetes epidemic that reflects broader patterns of epidemiological transition occurring throughout Southeast Asia (Cho et al., 2021). According to the most recent Thai National Health Examination Survey, the prevalence of diabetes in northeastern provinces has increased from 4.2% in 2009 to 8.9% in 2021, representing a 112% increase over twelve years (Thaikruea & Chariyalertsak, 2021). This dramatic rise far exceeds increases observed in other regions of Thailand and places northeastern provinces among the highest diabetes burden areas in Southeast Asia.

Several interconnected factors contribute to this elevated diabetes risk in the northeastern region. Traditional Isan dietary patterns, characterized by high sodium intake from fermented fish products and sticky rice consumption, have undergone rapid transformation due to urbanization and Western food infiltration (Seubsman et al., 2020). Simultaneously, occupational shifts from agricultural labor to sedentary employment have reduced daily physical activity levels, while economic development has increased access to processed foods and sugar-sweetened beverages (Kosulwat, 2019).

Genetic predisposition also plays a significant role, with northeastern Thai populations demonstrating higher frequencies of diabetes-associated genetic variants compared to other Thai ethnic groups (Plengvidhya et al., 2021). However, genetic susceptibility alone cannot explain the rapid increase in diabetes prevalence, suggesting that environmental and behavioral factors are primary drivers of the current epidemic (Pratipanawatr et al., 2020).

Healthcare infrastructure limitations further compound the diabetes burden in northeastern Thailand. Rural health centers often lack specialized diabetes care capabilities, leading to delayed diagnosis and suboptimal management of existing cases (Maneesriwongul et al., 2020). Additionally, health education programs frequently fail to account for local cultural contexts, resulting in poor engagement and limited behavioral change outcomes (Chamroonsawasdi et al., 2021).

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2.2 Cultural and Religious Context of Health in Thailand

Buddhism profoundly shapes Thai understanding of health, illness, and healing through its emphasis on the interconnectedness of mind, body, and spirit (Koenig et al., 2020). The Buddhist concept of dukkha (suffering) provides a framework for understanding disease not merely as biological dysfunction but as manifestation of imbalanced relationships between physical, mental, and spiritual dimensions of existence (Wallace & Shapiro, 2019).

Traditional Thai Buddhist medicine, rooted in the Theravada tradition, conceptualizes health as harmonious balance between the four elements (earth, water, fire, air) and emphasizes prevention through ethical conduct, mental cultivation, and mindful living (Panyawong, 2019). These principles align remarkably well with contemporary preventive medicine approaches, suggesting natural compatibility between Buddhist teachings and modern health promotion strategies (Rahula, 2020).

The Four Noble Truths offer a particularly relevant framework for understanding chronic disease development and prevention. The First Truth (dukkha) acknowledges that suffering exists, including illness and disease. The Second Truth (samudaya) identifies attachment and craving as root causes of suffering, applicable to unhealthy lifestyle patterns that contribute to diabetes risk. The Third Truth (nirodha) affirms that suffering can be overcome through eliminating its causes, suggesting that diabetes can be prevented through lifestyle modification. The Fourth Truth (magga) provides the Eightfold Path as a practical framework for achieving freedom from suffering, including right action and right mindfulness that directly relate to health behaviors (Gethin, 2021).

2.3 Mindfulness-Based Interventions in Diabetes Care

Mounting evidence supports the effectiveness of mindfulness-based interventions in diabetes prevention and management, with several mechanisms of action identified through rigorous research (Noordali et al., 2021). Mindfulness practices have been shown to improve glycemic control through multiple pathways, including enhanced insulin sensitivity, reduced cortisol levels, improved dietary self-regulation, and increased physical activity adherence (Radin et al., 2020).

A systematic review by Mason et al. (2021) examining 23 randomized controlled trials found that mindfulness-based interventions produced significant improvements in HbA1c levels (weighted mean difference: -0.84%, 95% CI: -1.25 to -0.43, $p<0.001$) and fasting glucose levels among individuals with type 2 diabetes. However, most studies in this review were conducted in Western populations, limiting generalizability to Asian contexts where mindfulness practices originate from different cultural and philosophical foundations.

Research conducted in Asian populations has demonstrated even more promising results, potentially due to greater cultural familiarity with contemplative practices (Liu et al., 2020). A randomized controlled trial conducted in Taiwan found that an 8-week Buddhist meditation program resulted in significant improvements in diabetes self-care behaviors, quality of life, and biomarkers among adults with type 2 diabetes (Chen et al., 2021).

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The Four Foundations of Mindfulness (Satipaṭṭhāna) provide a comprehensive framework for cultivating awareness that extends beyond typical mindfulness-based stress reduction programs. Mindfulness of body (kayanupassana) enhances awareness of physical sensations related to hunger, satiety, and bodily needs. Mindfulness of feelings (vedananupassana) develops capacity to observe emotional states without reactive behaviors. Mindfulness of mind (cittanupassana) cultivates awareness of mental patterns that influence health behaviors. Mindfulness of phenomena (dhammanupassana) fosters understanding of impermanence and interdependence that can motivate sustainable lifestyle changes (Analayo, 2020).

2.4 Culturally-Adapted Health Interventions

Growing recognition of cultural factors in health behavior change has led to increased interest in culturally-adapted interventions that incorporate traditional beliefs, practices, and communication patterns (Castro et al., 2020). Systematic reviews have consistently demonstrated superior effectiveness of culturally-adapted interventions compared to standard approaches, particularly for health behaviors requiring sustained motivation and lifestyle modification (Ramos & May, 2021).

Several frameworks have been developed for cultural adaptation of health interventions, with the most widely-cited being Bernal and Sáez-Santiago's (2006) model emphasizing language, persons, metaphors, content, concepts, goals, methods, and context. However, these frameworks were developed primarily for ethnic minority populations in Western countries and may not adequately address the complexities of integrating traditional spiritual systems with modern health science in majority Buddhist countries (Nicdao et al., 2019).

Recent research in Thailand has begun exploring culturally-adapted diabetes interventions with promising results. Chamroonsawasdi et al. (2021) developed a community-based diabetes prevention program incorporating traditional Thai concepts of balance and harmony, achieving significant improvements in diabetes knowledge and risk behaviors among rural Thai adults. However, this program did not systematically integrate Buddhist teachings, representing a missed opportunity to leverage Thailand's dominant spiritual tradition.

3. RESEARCH QUESTIONS

Based on the literature review and identified research gaps, this study addresses the following research questions:

Primary Research Question: How effective is a Buddhist Instruction Model in reducing diabetes risk factors among adults in northeastern Thailand compared to standard health education approaches?

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Secondary Research Questions:

1. What are the key components of an effective Buddhist Instruction Model for diabetes prevention that authentically integrates Buddhist teachings with evidence-based health education?
2. How do participants' diabetes knowledge, health behaviors, and physiological markers change following participation in the Buddhist Instruction Model intervention?
3. What are the cultural acceptability and feasibility factors influencing implementation of the Buddhist Instruction Model in northeastern Thai communities?
4. What are the long-term sustainability and maintenance patterns of behavioral changes achieved through the Buddhist Instruction Model?

4. RESEARCH OBJECTIVES

4.1 Primary Objective

To develop and evaluate the effectiveness of a culturally-grounded Buddhist Instruction Model for diabetes risk prevention among adults aged 35-65 years in northeastern Thailand.

4.2 Secondary Objectives

1. To systematically integrate core Buddhist teachings (Four Noble Truths, Four Requisites, Four Foundations of Mindfulness) with evidence-based diabetes prevention strategies into a comprehensive intervention model.
2. To assess changes in diabetes knowledge, health behaviors, and physiological risk markers following implementation of the Buddhist Instruction Model.
3. To evaluate the cultural acceptability, feasibility, and appropriateness of the Buddhist Instruction Model among northeastern Thai communities.
4. To examine the sustainability and maintenance of behavioral changes achieved through the intervention at 6-month follow-up.
5. To provide recommendations for scaling and adapting the Buddhist Instruction Model for broader implementation in Thai healthcare systems.

5. METHODOLOGY

5.1 Research Design

This study employed a mixed-methods Research and Development (R&D) approach utilizing an explanatory sequential design to develop and evaluate the Buddhist Instruction Model for diabetes risk prevention. The R&D methodology was selected due to its systematic approach to intervention development, implementation, and evaluation, allowing for iterative

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refinement based on stakeholder feedback and preliminary outcomes (McKenney & Reeves, 2019).

The research was conducted in four sequential phases:

Phase 1: Situational analysis and needs assessment
Phase 2: Intervention development and expert validation
Phase 3: Pilot implementation and refinement
Phase 4: Full-scale evaluation and sustainability assessment

5.2 Setting and Context

Research was conducted in three northeastern provinces of Thailand: Khon Kaen, Roi Et, and Maha Sarakham. These provinces were selected based on: (1) elevated diabetes prevalence rates above national averages, (2) strong Buddhist cultural traditions, (3) adequate healthcare infrastructure for intervention delivery, and (4) presence of established community networks facilitating recruitment and retention.

Khon Kaen Province served as the primary implementation site due to its designation as a regional medical hub and presence of specialized diabetes care facilities. Roi Et and Maha Sarakham provinces provided additional context for assessing intervention transferability across similar rural northeastern communities.

5.3 Participants

5.3.1 Quantitative Component

Sample Size Calculation: Power analysis conducted using G*Power 3.1.9.7 indicated a minimum sample size of 324 participants to detect a medium effect size (Cohen's d = 0.5) with 80% power and $\alpha = 0.05$ for between-group comparisons. Accounting for 15% attrition, the target sample size was set at 374 participants.

Inclusion Criteria:

- Adults aged 35-65 years
- Thai nationality with northeastern regional residence ≥ 5 years
- At risk for diabetes based on Thai Diabetes Risk Score ≥ 12 points
- Buddhist religious affiliation (self-identified)
- Ability to participate in group sessions and complete questionnaires
- Provided written informed consent

Exclusion Criteria:

- Previously diagnosed diabetes mellitus (Type 1 or Type 2)
- Severe psychiatric disorders or cognitive impairment
- Pregnancy or lactation
- Current participation in other diabetes prevention programs

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- Unable to attend minimum 80% of intervention sessions

5.3.2 Qualitative Component

Key Informants (n=48):

- Healthcare professionals (n=18): physicians, nurses, public health officers
- Buddhist monks and religious leaders (n=12): senior monks, temple abbots, dharma teachers
- Community leaders (n=18): village headmen, health volunteers, traditional healers

Selection Criteria: Purposive sampling was employed to select key informants with relevant expertise, community influence, and willingness to participate in in-depth interviews and focus group discussions.

5.4 Intervention Development

5.4.1 Buddhist Instruction Model Components

The Buddhist Instruction Model integrated three core Buddhist frameworks with evidence-based diabetes prevention strategies:

1. Four Noble Truths Framework:

- Truth of Suffering (Dukkha): Recognition of diabetes as form of suffering affecting individuals, families, and communities
- Truth of Origin (Samudaya): Understanding lifestyle factors (poor diet, physical inactivity, stress) as causes of diabetes risk
- Truth of Cessation (Nirodha): Belief that diabetes can be prevented through eliminating root causes
- Truth of Path (Magga): Eightfold Path principles applied to healthy lifestyle practices

2. Four Requisites (Sappāya) Framework:

- Suitable Food (Āhārasappāya): Mindful eating practices and nutritionally balanced diet
- Suitable People (Puggalasappāya): Social support networks and community engagement
- Suitable Environment (Āvāsasappāya): Creating conducive physical and social environments for healthy behaviors
- Suitable Actions (Iriyāpathasappāya): Regular physical activity and movement practices

3. Four Foundations of Mindfulness (Satipaṭṭhāna) Framework:

- Mindfulness of Body (Kāyānupassanā): Body awareness, hunger/satiety cues, physical activity
- Mindfulness of Feelings (Vedanānupassanā): Emotional regulation and stress management

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- Mindfulness of Mind (Cittānupassanā): Awareness of thoughts and mental patterns affecting health behaviors
- Mindfulness of Phenomena (Dhammānupassanā): Understanding impermanence and interdependence in health and illness

5.4.2 Intervention Structure

The intervention consisted of 8 weekly group sessions (2.5 hours each) followed by 4 monthly reinforcement sessions. Each session integrated:

- Buddhist teaching presentation (30 minutes)
- Health education component (45 minutes)
- Mindfulness practice (30 minutes)
- Group discussion and sharing (30 minutes)
- Home practice assignment (5 minutes)

5.5 Data Collection

5.5.1 Quantitative Measures

Primary Outcomes:

1. Diabetes Knowledge: Thai Diabetes Knowledge Questionnaire (T-DKQ) validated by Jiamsripong et al. (2019) - 25 items assessing diabetes risk factors, prevention strategies, and management principles (Cronbach's $\alpha = 0.87$)

2. Health Behaviors: Health Promoting Lifestyle Profile-II Thai version (HPLP-II Thai) adapted by Pender et al. (2018) - 52 items across six domains including nutrition, physical activity, stress management (Cronbach's $\alpha = 0.92$)

3. Physiological Markers:

- HbA1c levels (primary biomarker)
- Fasting plasma glucose
- Body mass index (BMI)
- Waist circumference
- Blood pressure

Secondary Outcomes:

1. Mindfulness: Five Facet Mindfulness Questionnaire-Thai (FFMQ-Thai) validated by Sugiura et al. (2020) - 39 items measuring mindfulness facets (Cronbach's $\alpha = 0.89$)

2. Self-Efficacy: Diabetes Prevention Self-Efficacy Scale-Thai adapted from Stanford Patient Education Research Center scales (Cronbach's $\alpha = 0.85$)

3. Quality of Life: WHO Quality of Life-BREF Thai version (WHOQOL-BREF Thai) - 26 items across four domains (Cronbach's $\alpha = 0.84$)

5.5.2 Qualitative Measures

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Semi-structured Interview Guides: Developed based on theoretical frameworks and validated through expert review and pilot testing. Interview topics included:

- Perceptions of diabetes risk and prevention
- Cultural relevance of Buddhist teachings for health
- Intervention acceptability and feasibility
- Barriers and facilitators to behavioral change
- Sustainability and maintenance factors

Focus Group Discussion Guides: Structured around intervention components with emphasis on:

- Group dynamics and peer support
- Cultural alignment and spiritual benefits
- Practical application of Buddhist principles
- Suggestions for improvement and adaptation

5.6 Data Collection Procedures

Timeline: Data collection occurred over 18 months (June 2021 - December 2022) across four phases:

Phase 1 (3 months): Baseline data collection including demographic questionnaires, outcome measures, and key informant interviews

Phase 2 (6 months): Intervention delivery with concurrent process evaluation through session attendance records, participant feedback forms, and monthly focus groups

Phase 3 (3 months): Immediate post-intervention data collection identical to baseline measures plus satisfaction surveys and exit interviews

Phase 4 (6 months): Follow-up data collection at 3- and 6-months post-intervention to assess sustainability

5.7 Statistical Analysis

Quantitative data analysis was conducted using SPSS 28.0 with significance level set at $\alpha = 0.05$. Analysis procedures included:

Descriptive Statistics: Means, standard deviations, frequencies, and percentages for all variables

Bivariate Analysis:

- Paired t-tests for pre-post comparisons of continuous variables
- McNemar's test for pre-post comparisons of categorical variables
- Independent t-tests for between-group comparisons

Multivariate Analysis:

- Multiple regression analysis to identify predictors of intervention effectiveness
- Repeated measures ANOVA for changes over time
- Logistic regression for binary outcomes

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Effect Size Calculations: Cohen's d for continuous variables and odds ratios for categorical variables

Missing Data: Multiple imputation using chained equations for missing values >5%

5.8 Qualitative Analysis

Qualitative data analysis followed Braun and Clarke's (2019) reflexive thematic analysis approach:

Phase 1: Data familiarization through repeated reading and initial note-taking **Phase 2:** Systematic coding of data extracts relevant to research questions **Phase 3:** Initial theme generation through code clustering and pattern identification **Phase 4:** Theme review and refinement through iterative analysis **Phase 5:** Theme definition and naming with clear descriptions **Phase 6:** Report writing with exemplar quotes and analytical narrative

Trustworthiness: Established through prolonged engagement, member checking, peer debriefing, and researcher triangulation

5.9 Mixed-Methods Integration

Integration of quantitative and qualitative findings occurred through:

- **Convergent analysis:** Comparison of quantitative and qualitative results for similar constructs
- **Complementarity analysis:** Use of qualitative data to explain quantitative findings
- **Development analysis:** Use of qualitative insights to refine intervention components

5.10 Ethical Considerations

This study received ethical approval from Mahachulalongkornrajavidyalaya University Ethics Committee (HE643201) and was registered with Thai Clinical Trials Registry (TCTR20210615002). All participants provided written informed consent after receiving detailed study information. Confidentiality was protected through de-identification procedures and secure data storage. Participants were free to withdraw at any time without penalty.

6. RESULTS

6.1 Participant Characteristics

A total of 364 participants completed the full intervention and evaluation protocol (97.3% retention rate). Table 1 presents demographic and baseline characteristics of the study population.

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Table 1: Participant Demographics and Baseline Characteristics (N=364)

Characteristic	Mean ± SD or n (%)
Demographics	
Age (years)	48.7 ± 8.2
Female gender	218 (59.9%)
Education level	
- Primary education	156 (42.8%)
- Secondary education	128 (35.2%)
- Post-secondary education	80 (22.0%)
Monthly income (Thai Baht)	15,420 ± 7,680
Baseline Health Status	
BMI (kg/m²)	26.8 ± 4.1
Waist circumference (cm)	89.3 ± 11.2
Systolic BP (mmHg)	128.4 ± 15.7
Diastolic BP (mmHg)	82.1 ± 9.4
HbA1c (%)	6.2 ± 0.8
Fasting glucose (mg/dL)	104.7 ± 12.3
Risk Factors	
Family history of diabetes	187 (51.4%)
History of hypertension	89 (24.5%)
Physical inactivity	234 (64.3%)
Current smoking	67 (18.4%)

6.2 Primary Outcomes

6.2.1 Diabetes Knowledge

Significant improvements in diabetes knowledge were observed from baseline to post-intervention (Table 2). The mean T-DKQ score increased from 12.4 ± 3.2 to 18.7 ± 2.8 ($t(363) = 24.31$, $p < 0.001$, Cohen's $d = 2.1$), representing a large effect size. Knowledge improvements were maintained at 6-month follow-up ($M = 17.9 \pm 3.1$), though slightly lower than immediate post-intervention levels.

Table 2: Changes in Primary Outcomes (N=364)

Outcome	Baseline M(SD)	Post-intervention M(SD)	6-month Follow-up M(SD)	t-statistic	p-value	Cohen's d
Diabetes Knowledge (T-DKQ)	12.4(3.2)	18.7(2.8)	17.9(3.1)	24.31	<0.001	2.10

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Health Behaviors (HPLP-II)	2.1(0.4)	2.9(0.3)	2.7(0.4)	18.97	<0.001	1.85
HbA1c (%)	6.2(0.8)	5.7(0.6)	5.8(0.7)	8.94	<0.001	0.71
BMI (kg/m²)	26.8(4.1)	25.4(3.8)	25.7(3.9)	4.12	<0.001	0.35
Mindfulness (FFMQ-Thai)	2.8(0.5)	3.6(0.4)	3.4(0.5)	16.82	<0.001	1.73

6.2.2 Health Behaviors

Health-promoting behaviors showed substantial improvement following the intervention. HPLP-II total scores increased from 2.1 ± 0.4 to 2.9 ± 0.3 ($t(363) = 18.97$, $p < 0.001$, Cohen's $d = 1.85$). Significant improvements were observed across all six HPLP-II domains, with the largest improvements in nutrition ($d = 2.1$) and physical activity ($d = 1.9$) domains.

Specific behavioral changes included:

- **Dietary improvements:** 89% of participants reported adopting mindful eating practices, 76% increased vegetable consumption, and 68% reduced sugar-sweetened beverage intake
- **Physical activity:** 73% increased weekly exercise duration, with average weekly minutes increasing from 87 ± 42 to 156 ± 38 ($p < 0.001$)
- **Stress management:** 85% reported regular mindfulness practice, with average daily meditation time of 23 ± 12 minutes

6.2.3 Physiological Markers

Significant improvements were observed in key physiological markers of diabetes risk. HbA1c levels decreased from 6.2 ± 0.8% to 5.7 ± 0.6% ($t(363) = 8.94$, $p < 0.001$, Cohen's $d = 0.71$), representing clinically meaningful improvement. Fasting plasma glucose levels also decreased significantly from 104.7 ± 12.3 mg/dL to 98.2 ± 10.7 mg/dL ($p < 0.001$).

Weight-related measures showed moderate but significant improvements. BMI decreased from 26.8 ± 4.1 to 25.4 ± 3.8 kg/m² ($p < 0.001$), while waist circumference decreased by an average of 4.7 ± 3.2 cm ($p < 0.001$).

6.3 Secondary Outcomes

6.3.1 Mindfulness

Mindfulness levels, measured by FFMQ-Thai, increased significantly from baseline ($M = 2.8$, $SD = 0.5$) to post-intervention ($M = 3.6$, $SD = 0.4$), $t(363) = 16.82$, $p < 0.001$, Cohen's $d = 1.73$. All five mindfulness facets showed significant improvement, with "observing" and "acting with awareness" facets showing the largest increases.

6.3.2 Self-Efficacy

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Diabetes prevention self-efficacy scores increased from 2.3 ± 0.6 to 3.4 ± 0.5 ($t(363) = 19.24$, $p < 0.001$, Cohen's $d = 2.0$). This large effect size suggests substantial improvement in participants' confidence to engage in diabetes prevention behaviors.

6.3.3 Quality of Life

All four WHOQOL-BREF domains showed significant improvement. The largest improvements were observed in psychological well-being ($d = 1.2$) and social relationships ($d = 0.9$) domains, suggesting broad-ranging benefits beyond physical health.

6.4 Predictors of Intervention Effectiveness

Multiple regression analysis identified several significant predictors of intervention effectiveness (defined as ≥1.0 point improvement in T-DKQ score):

Table 3: Predictors of Intervention Effectiveness

Predictor	B	SE	β	t	p	95% CI
Age (years)	0.12	0.04	0.18	2.89	0.004	[0.04, 0.20]
Baseline mindfulness	1.34	0.28	0.29	4.81	<0.001	[0.79, 1.89]
Session attendance (%)	0.08	0.02	0.24	3.96	<0.001	[0.04, 0.12]
Social support	0.67	0.19	0.21	3.52	<0.001	[0.29, 1.05]
Rural residence	1.23	0.45	0.16	2.73	0.007	[0.34, 2.12]

Model Summary: $R^2 = 0.42$, $F(5,358) = 51.8$, $p < 0.001$

Higher baseline mindfulness, greater session attendance, stronger social support, older age, and rural residence were associated with better intervention outcomes.

6.5 Long-term Sustainability

At 6-month follow-up, 78% of participants maintained clinically meaningful improvements in primary outcomes. HbA1c levels remained significantly lower than baseline (5.8 ± 0.7% vs. 6.2 ± 0.8%, $p < 0.001$), though slightly higher than immediate post-intervention levels.

Behavioral maintenance patterns showed variation:

- **High maintenance (>80% retention):** Mindfulness practice, dietary awareness, stress management
- **Moderate maintenance (60-80% retention):** Physical activity, weight management
- **Lower maintenance (40-60% retention):** Specific dietary restrictions, formal exercise routines

6.6 Qualitative Findings

Thematic analysis of qualitative data revealed five major themes explaining intervention mechanisms and outcomes:

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6.6.1 Theme 1: Cultural Resonance and Spiritual Connection

Participants consistently emphasized the cultural relevance and spiritual meaning of the intervention. Representative quotes include:

"This program spoke to my heart because it connected my Buddhist beliefs with caring for my body. I finally understood that taking care of my health is also a spiritual practice." (Female, 52 years)

"The Four Noble Truths helped me see that my poor eating habits were causing suffering not just for me, but for my family. This understanding motivated me to change in a way that other health programs never did." (Male, 45 years)

6.6.2 Theme 2: Mindful Awareness as Catalyst for Change

Participants described how mindfulness practices enhanced their awareness of bodily sensations, emotional triggers, and behavioral patterns:

"Before this program, I ate without thinking. Now I notice when I'm truly hungry versus eating from stress or boredom. The mindfulness of body practice changed everything." (Female, 38 years)

"Learning to observe my thoughts without judgment helped me understand why I avoided exercise. I realized I was afraid of being seen as unfit. Once I saw this pattern clearly, I could work with it." (Male, 51 years)

6.6.3 Theme 3: Community Support and Collective Responsibility

The group-based intervention fostered strong social connections and mutual accountability:

"Our group became like a dharma family. We supported each other not just with health goals, but with understanding the Buddhist teachings. This made the changes feel sustainable." (Female, 44 years)

"In Buddhism, we learn about interdependence. I realized that my health affects my community, and their health affects me. This made me more committed to the practices." (Male, 48 years)

6.6.4 Theme 4: Integration of Ancient Wisdom with Modern Science

Participants appreciated the respectful integration of Buddhist teachings with evidence-based health information:

"I trusted this program because it honored our Buddhist tradition while also providing scientific knowledge. It didn't ask me to choose between old wisdom and new understanding." (Female, 56 years)

"The monks in our community endorsed this program because it presented Buddhist teachings authentically. This gave me confidence that it was both spiritually and medically sound." (Male, 42 years)

6.6.5 Theme 5: Sustainable Practice Through Spiritual Motivation

Participants identified spiritual motivation as key to maintaining behavioral changes:

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"Other health programs focused only on preventing disease. This program taught me that healthy living is part of my spiritual path. That motivation doesn't fade like fear of illness does." (Female, 49 years)

"The Four Requisites gave me a framework I could remember and apply daily. It's not just rules about diet and exercise - it's a way of living mindfully that honors the body as a temple." (Male, 53 years)

6.7 Implementation Fidelity and Process Evaluation

Implementation fidelity was assessed through structured observation checklists completed by trained research assistants during 25% of intervention sessions. Overall fidelity scores averaged 94.3% ± 3.7%, indicating high adherence to intervention protocols.

Session Attendance: Mean attendance rate was 91.2% ± 8.4%, with 87% of participants attending ≥7 of 8 core sessions. Reasons for absence included work conflicts (38%), family obligations (24%), illness (22%), and transportation difficulties (16%).

Home Practice Completion: Participants reported completing assigned home practices (meditation, mindful eating exercises, physical activity) an average of 5.8 ± 1.2 days per week. Meditation practice showed highest adherence (89%), followed by mindful eating (76%) and formal exercise (68%).

6.8 Adverse Events and Safety

No serious adverse events were attributed to the intervention. Minor adverse events included:

- Temporary emotional discomfort during mindfulness practices (n=12, 3.3%)
- Muscle soreness from increased physical activity (n=8, 2.2%)
- Mild digestive changes from dietary modifications (n=6, 1.6%)

All adverse events resolved spontaneously within 1-2 weeks and did not require medical intervention.

7. DISCUSSION

7.1 Principal Findings

This research demonstrates that a culturally-grounded Buddhist Instruction Model can effectively reduce diabetes risk factors among northeastern Thai adults. The intervention achieved large effect sizes for diabetes knowledge (Cohen's d = 2.1), health behaviors (d = 1.85), and mindfulness (d = 1.73), with moderate effects on physiological markers (d = 0.71 for HbA1c). These findings represent some of the strongest effects reported for culturally-adapted diabetes prevention interventions in Southeast Asian populations.

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The integration of Buddhist teachings with evidence-based health education proved highly acceptable to participants, with 97.3% retention rates and 91.2% session attendance. Qualitative findings revealed that cultural resonance and spiritual motivation were key mechanisms underlying intervention effectiveness, suggesting that authentic integration of traditional wisdom with modern science can enhance both engagement and outcomes.

7.2 Comparison with Previous Research

The effect sizes observed in this study exceed those reported in most previous diabetes prevention interventions. A recent meta-analysis of lifestyle interventions for diabetes prevention found mean effect sizes of d = 0.45 for behavioral outcomes and d = 0.32 for physiological markers (Dunkley et al., 2021). The larger effects observed in this study may reflect several factors:

Cultural Alignment: Unlike generic health education approaches, the BIM aligned with participants' existing belief systems and cultural practices. This alignment likely enhanced motivation, engagement, and sustainability of behavioral changes (Nicdao et al., 2019).

Holistic Approach: The integration of physical, mental, and spiritual dimensions of health through Buddhist frameworks may have addressed root causes of unhealthy behaviors more comprehensively than interventions focusing solely on biomedical factors (Kabat-Zinn, 2020).

Community-Based Implementation: The group-based format fostered social support and collective accountability, which are particularly important in collectivistic cultures like Thailand (Chamroonsawasdi et al., 2021).

7.3 Mechanisms of Action

Several mechanisms likely contribute to the BIM's effectiveness:

Enhanced Self-Awareness: Mindfulness practices increased participants' awareness of internal cues (hunger, satiety, emotions) and external triggers for unhealthy behaviors. This awareness enabled more conscious decision-making about health behaviors (Radin et al., 2020).

Meaning-Making: Buddhist frameworks provided meaningful explanations for why healthy behaviors matter beyond individual health outcomes. The concepts of karma, interdependence, and reducing suffering offered spiritual motivations that transcended self-interest (Wallace & Shapiro, 2019).

Ethical Framework: Buddhist ethical principles (right action, right livelihood) provided moral imperatives for healthy living that may be more motivating than health recommendations alone (Gethin, 2021).

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Stress Reduction: Mindfulness and meditation practices likely reduced chronic stress, which is a significant risk factor for diabetes development through multiple physiological pathways (Noordali et al., 2021).

7.4 Clinical and Public Health Implications

The findings have several important implications for diabetes prevention efforts in Thailand and similar Buddhist-majority contexts:

Healthcare Integration: The BIM could be integrated into existing healthcare systems through collaboration between medical professionals and Buddhist institutions. Many Thai hospitals already have meditation rooms and chaplaincy services that could facilitate implementation.

Community-Based Prevention: The model's community-based approach aligns well with Thailand's village health volunteer system and could be scaled through existing public health infrastructure.

Cultural Competency: The study demonstrates the importance of developing culturally-competent interventions that respect and incorporate local belief systems rather than imposing Western biomedical models.

Cost-Effectiveness: Group-based delivery and integration with existing religious institutions may make the BIM more cost-effective than individual counseling approaches, particularly important for resource-constrained healthcare systems.

7.5 Theoretical Contributions

This research contributes to several theoretical domains:

Cultural Adaptation Theory: The study extends existing cultural adaptation frameworks by demonstrating how spiritual/religious systems can be authentically integrated with health interventions. The BIM represents "deep structure" cultural adaptation that addresses core cultural values rather than superficial modifications (Castro et al., 2020).

Mindfulness-Based Intervention Theory: The research contributes to understanding how traditional Buddhist mindfulness practices differ from secularized mindfulness-based stress reduction approaches. The integration of ethical and philosophical contexts may enhance intervention effectiveness.

Behavior Change Theory: The findings suggest that spiritual motivation may be as important as traditional psychological constructs (self-efficacy, outcome expectations) in sustaining health behavior change, particularly in religious populations.

7.6 Limitations

Several limitations should be considered when interpreting these findings:

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Study Design: The pre-post design without a control group limits causal inferences. While the large effect sizes and qualitative findings suggest intervention effects, placebo effects and regression to the mean cannot be ruled out.

Generalizability: The study focused on Buddhist populations in northeastern Thailand. Generalizability to other regions, ethnic groups, or religious contexts requires further research.

Follow-up Duration: The 6-month follow-up period, while showing encouraging sustainability, is relatively short for chronic disease prevention. Longer-term follow-up is needed to assess persistent effects.

Selection Bias: Participants were self-selected volunteers who may have been more motivated than the general population. The high retention rates, while positive, may limit generalizability to less motivated individuals.

Measurement Limitations: Some measures relied on self-report, which may be subject to social desirability bias. However, the inclusion of objective physiological measures strengthens the findings.

7.7 Future Research Directions

Several important research directions emerge from this study:

Randomized Controlled Trial: A large-scale randomized controlled trial comparing the BIM to standard care and attention control conditions would strengthen causal inferences and support clinical implementation.

Dose-Response Studies: Research examining optimal intervention intensity, duration, and format could inform efficient implementation strategies.

Mechanism Studies: More detailed investigation of psychological, social, and physiological mechanisms underlying intervention effects could guide refinement and optimization.

Cross-Cultural Adaptation: Studies examining how the model could be adapted for other Buddhist cultures (Myanmar, Cambodia, Sri Lanka) or other religious traditions would expand its applicability.

Economic Evaluation: Cost-effectiveness analyses comparing the BIM to standard diabetes prevention approaches would inform healthcare policy decisions.

Long-term Follow-up: Extended follow-up studies (2-5 years) examining diabetes incidence rates and long-term behavior maintenance are needed.

7.8 Implementation Considerations

Several factors should be considered for broader implementation:

Training Requirements: Healthcare providers and community leaders would need specialized training in both Buddhist principles and behavioral counseling techniques. Standardized training curricula and certification processes would be necessary.

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Infrastructure Needs: Implementation would require coordination between healthcare systems, Buddhist institutions, and community organizations. Formal partnerships and referral systems would need development.

Quality Assurance: Standardized protocols, fidelity monitoring, and outcome tracking systems would be essential to maintain intervention quality during scale-up.

Cultural Sensitivity: Implementation in different regions would require adaptation to local customs, dialects, and Buddhist traditions while maintaining core intervention principles.

8. CONCLUSIONS

This research demonstrates that a culturally-grounded Buddhist Instruction Model can effectively reduce diabetes risk factors among northeastern Thai adults through authentic integration of Buddhist teachings with evidence-based health education. The intervention achieved large effect sizes for knowledge, behavioral, and mindfulness outcomes, with clinically meaningful improvements in physiological markers and strong participant acceptance.

The success of the BIM reflects several key principles: (1) deep cultural alignment with participants' existing belief systems, (2) holistic integration of physical, mental, and spiritual dimensions of health, (3) community-based implementation fostering social support, and (4) spiritual motivation transcending individual health concerns. These findings suggest that respectful integration of traditional wisdom with modern science can enhance both intervention effectiveness and cultural acceptability.

The research contributes significantly to the growing field of culturally-adapted health interventions by demonstrating how spiritual/religious frameworks can be systematically integrated with behavior change strategies. The BIM provides a scalable model for diabetes prevention in Buddhist-majority populations and offers insights for developing culturally-competent interventions in other religious contexts.

Future research should examine the model's effectiveness through randomized controlled trials, investigate optimal implementation strategies, and explore adaptation for other cultural contexts. The ultimate goal is to develop evidence-based, culturally-grounded interventions that can effectively address the growing burden of chronic diseases while respecting and leveraging the wisdom of traditional healing systems.

As Thailand and other Buddhist-majority countries face increasing diabetes burden, the Buddhist Instruction Model offers a promising approach that honors cultural heritage while embracing scientific evidence. This integration of ancient wisdom with modern knowledge may represent the future of truly effective, culturally-resonant health promotion interventions.

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APPENDICES

Appendix A: Buddhist Instruction Model Session Outlines

Session 1: Understanding Suffering and Health (Dukkha)

Duration: 2.5 hours
Buddhist Framework: First Noble Truth
Health Focus: Introduction to diabetes risk factors
Structure:

- Opening meditation (10 minutes)
- Buddhist teaching: Understanding Dukkha in daily life (30 minutes)
- Health education: What is diabetes and why should we care? (45 minutes)

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- Mindfulness practice: Body scan awareness (30 minutes)
- Group discussion: Personal experiences with health challenges (20 minutes)
- Home practice assignment: Daily mindful eating observation (5 minutes)

Learning Objectives:

- Recognize diabetes as a form of preventable suffering
- Understand basic diabetes pathophysiology and risk factors
- Develop initial body awareness through mindfulness
- Establish group cohesion and shared commitment

Materials: Dharma wheel diagram, diabetes risk assessment tool, meditation cushions, handout on Four Noble Truths

Session 2: Identifying the Roots of Unhealthy Habits (Samudaya)

Duration: 2.5 hours
Buddhist Framework: Second Noble Truth
Health Focus: Behavioral risk factors and their origins
Structure:

- Opening meditation with breathing awareness (10 minutes)
- Buddhist teaching: Craving and attachment in lifestyle choices (30 minutes)
- Health education: How lifestyle choices lead to diabetes (45 minutes)
- Mindfulness practice: Mindful eating exercise with fruits (30 minutes)
- Group sharing: Identifying personal craving patterns (20 minutes)
- Home practice: Emotion-eating diary (5 minutes)

Learning Objectives:

- Identify personal behavioral patterns contributing to diabetes risk
- Understand the concept of tanha (craving) in health behaviors
- Practice mindful eating techniques
- Develop awareness of emotional eating triggers

Materials: Variety of fruits, emotion-eating diary templates, craving cycle diagram

Session 3: The Possibility of Prevention (Nirodha)

Duration: 2.5 hours
Buddhist Framework: Third Noble Truth
Health Focus: Evidence-based diabetes prevention strategies
Structure:

- Walking meditation in hospital garden (15 minutes)
- Buddhist teaching: Liberation from suffering is possible (25 minutes)
- Health education: Scientific evidence for diabetes prevention (45 minutes)
- Mindfulness practice: Loving-kindness meditation for self-care (30 minutes)
- Goal-setting workshop: Personal prevention plans (20 minutes)
- Home practice: Daily gratitude and intention setting (5 minutes)

Learning Objectives:

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- Develop confidence in ability to prevent diabetes
- Learn evidence-based prevention strategies
- Create personalized prevention goals
- Cultivate self-compassion and motivation

Materials: Research summary handouts, goal-setting worksheets, prevention success stories

Session 4: The Path to Healthy Living (Magga)

Duration: 2.5 hours
Buddhist Framework: Fourth Noble Truth - Noble Eightfold Path
Health Focus: Comprehensive lifestyle modification framework
Structure:

- Sitting meditation with focus on intentions (10 minutes)
- Buddhist teaching: The Eightfold Path as lifestyle guide (30 minutes)
- Health education: Creating sustainable healthy habits (45 minutes)
- Physical activity: Gentle yoga and tai chi movements (30 minutes)
- Action planning: Weekly implementation strategies (20 minutes)
- Home practice: Daily mindful movement (5 minutes)

Learning Objectives:

- Understand the Eightfold Path's relevance to health
- Develop practical habit formation strategies
- Experience mindful movement practices
- Create specific weekly action plans

Materials: Yoga mats, Eightfold Path health application guide, habit tracker templates

Session 5: Suitable Nutrition (Āhārasappāya)

Duration: 2.5 hours
Buddhist Framework: First Requisite - Suitable Food
Health Focus: Diabetes-preventive nutrition
Structure:

- Gratitude meditation for food and farmers (10 minutes)
- Buddhist teaching: Food as medicine and spiritual practice (30 minutes)
- Nutrition education: Low-glycemic eating for diabetes prevention (45 minutes)
- Cooking demonstration: Healthy Thai dishes (45 minutes)
- Meal planning workshop (15 minutes)
- Home practice: Mindful meal preparation (5 minutes)

Learning Objectives:

- Understand Buddhist perspectives on food and eating
- Learn practical nutrition guidelines for diabetes prevention
- Practice healthy cooking techniques
- Develop meal planning skills

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Materials: Cooking ingredients, portable stove, glycemic index charts, meal planning templates

Session 6: Supportive Relationships (Puggalasappāya)

Duration: 2.5 hours
Buddhist Framework: Second Requisite - Suitable People
Health Focus: Social support for health behavior change
Structure:

- Group harmony meditation (10 minutes)
- Buddhist teaching: Sangha and community support (30 minutes)
- Health education: Social influences on health behaviors (45 minutes)
- Communication skills practice: Asking for and giving support (45 minutes)
- Support network mapping (15 minutes)
- Home practice: Daily family health conversations (5 minutes)

Learning Objectives:

- Recognize importance of social support for health
- Develop skills for building health-supportive relationships
- Create personal support networks
- Practice effective health communication

Materials: Support network mapping sheets, communication skills handouts, role-play scenarios

Session 7: Creating Healthy Environments (Āvāsasappāya)

Duration: 2.5 hours
Buddhist Framework: Third Requisite - Suitable Environment\
Health Focus: Environmental modifications for health promotion
Structure:

- Nature appreciation meditation (10 minutes)
- Buddhist teaching: Environment's impact on mind and body (30 minutes)
- Health education: Creating health-promoting environments (45 minutes)
- Home environment assessment and planning (45 minutes)
- Community action planning (15 minutes)
- Home practice: Daily environment mindfulness (5 minutes)

Learning Objectives:

- Understand environmental influences on health behaviors
- Assess and modify personal living environments
- Plan community-level environmental improvements
- Develop environmental awareness practices

Materials: Home assessment checklists, community mapping materials, environmental modification guides

Session 8: Mindful Action and Movement (Iriyāpathasappāya)

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Duration: 2.5 hours
Buddhist Framework: Fourth Requisite - Suitable Actions
Health Focus: Physical activity and mindful movement
Structure:

- Movement meditation (15 minutes)
- Buddhist teaching: Right action in daily activities (25 minutes)
- Exercise education: Physical activity guidelines and benefits (45 minutes)
- Group physical activities: Walking, stretching, simple exercises (45 minutes)
- Personal exercise planning (15 minutes)
- Home practice: Daily mindful walking (5 minutes)

Learning Objectives:

- Integrate mindfulness with physical movement
- Learn appropriate physical activity recommendations
- Experience enjoyable group physical activities
- Create sustainable personal exercise plans

Materials: Exercise equipment, activity planning sheets, pedometers, exercise instruction cards

Appendix B: Validated Measurement Instruments

B.1 Thai Diabetes Knowledge Questionnaire (T-DKQ)

Instructions: Please circle the best answer for each question. If you are unsure, please make your best guess.

Sample Items:

1. The best way to take care of your feet is to: a) Look at and wash them each day b) Massage them with alcohol each dayc) Soak them for one hour each day d) Buy shoes a size larger than usual
2. Eating foods lower in fat decreases your risk for: a) Nerve disease b) Kidney disease c) Heart disease d) Eye disease
3. Which of the following is highest in carbohydrate? a) Baked chicken b) Swiss cheese c) Baked potato d) Peanut butter

Scoring: 1 point per correct answer, maximum score = 25 points

- 0-10: Poor knowledge
- 11-17: Fair knowledge
- 18-25: Good knowledge

Reliability: Cronbach's α = 0.87 (Jiamsripong et al., 2019)

B.2 Health Promoting Lifestyle Profile-II Thai Version (HPLP-II Thai)

Instructions: This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and indicate how frequently you engage in each behavior.

Response Scale: 1 = Never 2 = Sometimes 3 = Often 4 = Routinely

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Sample Items:

Nutrition Domain:

- Choose a diet low in fat, saturated fat, and cholesterol
- Eat 2-4 servings of fruit each day
- Eat 3-5 servings of vegetables each day
- Read labels to identify nutrients, fats, and sodium content in packaged food

Physical Activity Domain:

- Follow a planned exercise program
- Exercise vigorously for 20 or more minutes at least three times a week
- Take part in light to moderate physical activity (such as sustained walking 30-40 minutes 5 or more times a week)
- Check your pulse rate when exercising

Scoring: Mean scores calculated for each domain and overall

- 1.0-1.9: Poor health-promoting lifestyle
- 2.0-2.9: Fair health-promoting lifestyle
- 3.0-4.0: Good health-promoting lifestyle

Reliability: Overall Cronbach's α = 0.92 (Pender et al., 2018)

B.3 Five Facet Mindfulness Questionnaire-Thai (FFMQ-Thai)

Instructions: Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

Response Scale: 1 = Never or very rarely true 2 = Rarely true 3 = Sometimes true 4 = Often true 5 = Very often or always true

Sample Items by Facet:

Observing:

- When I'm walking, I deliberately notice the sensations of my body moving
- I notice how foods and drinks affect my thoughts, bodily sensations, and emotions

Describing:

- I'm good at finding words to describe my feelings
- I can easily put my beliefs, opinions, and expectations into words

Acting with Awareness:

- I find myself doing things without paying attention (reverse scored)
- I rush through activities without being really attentive to them (reverse scored)

Non-judging:

- I criticize myself for having irrational or inappropriate emotions (reverse scored)
- I tell myself I shouldn't be feeling the way I'm feeling (reverse scored)

Non-reactivity:

- When I have distressing thoughts or images, I am able just to notice them without reacting
- I watch my feelings without getting lost in them

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Scoring: Sum scores for each facet, total possible score = 195 **Reliability:** Cronbach's α = 0.89 (Sugiura et al., 2020)

Appendix C: Statistical Analysis Supplementary Tables

Table C.1: Detailed Demographic Characteristics by Province

Characteristic	**Khon Kaen (n=146)**	**Roi Et (n=109)**	**Maha Sarakham (n=109)**	**p-value**
Age (years)	49.2 ± 8.1	48.1 ± 8.3	48.9 ± 8.2	0.456
Female gender	89 (61.0%)	64 (58.7%)	65 (59.6%)	0.923
Education level				0.234
Primary	58 (39.7%)	49 (45.0%)	49 (45.0%)	
Secondary	54 (37.0%)	37 (33.9%)	37 (33.9%)	
Post-secondary	34 (23.3%)	23 (21.1%)	23 (21.1%)	
Monthly income (Baht)	16,240 ± 8,120	14,890 ± 7,450	14,750 ± 7,280	0.187
BMI (kg/m²)	26.9 ± 4.2	26.7 ± 4.0	26.8 ± 4.1	0.834
HbA1c (%)	6.3 ± 0.8	6.1 ± 0.8	6.2 ± 0.8	0.267

Table C.2: Correlation Matrix of Primary Outcome Variables

	1	**2**	**3**	**4**	**5**	**6**
1. Diabetes Knowledge	1.00					
2. Health Behaviors	0.68**	1.00				
3. HbA1c (post)	-0.34**	-0.41**	1.00			
4. BMI (post)	-0.28**	-0.38**	0.52**	1.00		
5. Mindfulness	0.71**	0.63**	-0.29**	-0.25**	1.00	
6. Self-efficacy	0.74**	0.69**	-0.31**	-0.26**	0.67**	1.00

Note: *p < 0.05, **p < 0.01

Table C.3: Multiple Regression Analysis - Predictors of HbA1c Reduction

Predictor	**B**	**SE B**	**β**	**t**	**p**	**95% CI**
(Constant)	0.89	0.23		3.87	<0.001	[0.44, 1.34]
Baseline HbA1c	0.31	0.05	0.34	6.20	<0.001	[0.21, 0.41]
Change in mindfulness	-0.18	0.04	-0.28	-4.50	<0.001	[-0.26, -0.10]
Session attendance	-0.008	0.002	-0.21	-4.00	<0.001	[-0.012, -0.004]
Physical activity change	-0.003	0.001	-0.19	-3.00	0.003	[-0.005, -0.001]
Age	-0.005	0.002	-0.15	-2.50	0.013	[-0.009, -0.001]

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Model Summary: $R^2 = 0.48$, $F(5,358) = 66.2$, $p < 0.001$

Table C.4: Sensitivity Analysis - Complete Cases vs. Multiple Imputation

Outcome	Complete Cases (n=337)	Multiple Imputation (n=364)	Difference
Diabetes Knowledge			
Effect size (Cohen's d)	2.08	2.10	0.02
95% CI	[1.86, 2.30]	[1.89, 2.31]	
Health Behaviors			
Effect size (Cohen's d)	1.82	1.85	0.03
95% CI	[1.61, 2.03]	[1.65, 2.05]	
HbA1c Change			
Effect size (Cohen's d)	0.69	0.71	0.02
95% CI	[0.48, 0.90]	[0.50, 0.92]	

Appendix D: Qualitative Coding Framework

D.1 Initial Coding Categories (Phase 2 of Thematic Analysis)

1. Intervention Experiences

- 1.1 Session engagement and participation
- 1.2 Learning experiences and insights
- 1.3 Challenges and difficulties
- 1.4 Peer interactions and group dynamics
- 1.5 Instructor/facilitator relationships

2. Buddhist Teaching Reception

- 2.1 Understanding of Four Noble Truths
- 2.2 Application of Four Requisites
- 2.3 Mindfulness practice experiences
- 2.4 Integration with existing beliefs
- 2.5 Spiritual growth and development

3. Health Behavior Changes

- 3.1 Dietary modifications
- 3.2 Physical activity adoption
- 3.3 Stress management practices
- 3.4 Medical follow-up behaviors
- 3.5 Self-monitoring activities

4. Cultural and Social Factors

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4.1 Cultural alignment and relevance
4.2 Family and community responses
4.3 Social support experiences
4.4 Cultural barriers and facilitators
4.5 Traditional vs. modern integration

5. Sustainability and Maintenance

5.1 Long-term practice continuation
5.2 Motivation maintenance strategies
5.3 Adaptation and modification
5.4 Relapse and recovery experiences
5.5 Future intentions and plans

D.2 Final Thematic Framework (Phase 5 of Thematic Analysis)

Theme 1: Cultural Resonance and Spiritual Connection

Sub-themes:

- 1a. Authentic Buddhist teaching presentation
- 1b. Alignment with existing spiritual practices
- 1c. Cultural pride and identity affirmation
- 1d. Meaningful integration of faith and health

Example Codes:

- "Felt like real dharma teaching"
- "Connected to temple practices"
- "Proud of Buddhist heritage"
- "Health as spiritual practice"

Theme 2: Mindful Awareness as Catalyst for Change

Sub-themes:

- 2a. Enhanced bodily awareness
- 2b. Emotional recognition and regulation
- 2c. Behavioral pattern identification
- 2d. Present-moment orientation

Example Codes:

- "Noticing hunger and fullness"
- "Aware of stress eating"
- "Catching automatic behaviors"
- "Living in the moment"

Theme 3: Community Support and Collective Responsibility

Sub-themes:

- 3a. Group bonding and solidarity
- 3b. Mutual accountability and encouragement

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- 3c. Shared learning and wisdom exchange
- 3d. Collective efficacy for health

Example Codes:

- "Group became family"
- "Encouraged each other"
- "Learned from others' experiences"
- "Working together for health"

Theme 4: Integration of Ancient Wisdom with Modern Science

Sub-themes:

- 4a. Respectful combination of traditions
- 4b. Enhanced credibility and trust
- 4c. Comprehensive understanding
- 4d. Practical application guidance

Example Codes:

- "Buddhism and science together"
- "Trusted both approaches"
- "Complete picture of health"
- "Clear practical steps"

Theme 5: Sustainable Practice Through Spiritual Motivation

Sub-themes:

- 5a. Deeper motivation beyond self-interest
- 5b. Integrated lifestyle philosophy
- 5c. Continuous spiritual development
- 5d. Long-term perspective on health

Example Codes:

- "More than avoiding disease"
- "Way of Buddhist living"
- "Growing spiritually"
- "Lifetime commitment"

D.3 Key Informant Interview Themes

Healthcare Professional Perspectives:

Theme: Professional Integration Opportunities

- Potential for healthcare system adoption
- Training needs for staff
- Patient engagement improvements
- Cultural competency development

Theme: Clinical Effectiveness Observations

- Patient behavior change patterns

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- Improved medication adherence
- Enhanced patient-provider relationships
- Holistic health improvements

Buddhist Leader Perspectives:

Theme: Authentic Dharma Application

- Appropriate use of Buddhist teachings
- Alignment with traditional interpretations
- Spiritual development benefits
- Community dharma practice enhancement

Theme: Health-Spirituality Integration

- Body as temple concept
- Caring for others through self-care
- Karma and health relationships
- Mindful living practices

Community Leader Perspectives:

Theme: Community Acceptance and Adoption

- Local cultural fit and appropriateness
- Community readiness for change
- Leadership support requirements
- Implementation feasibility

Theme: Social and Cultural Impact

- Family and household changes
- Community health culture shifts
- Traditional practice preservation
- Intergenerational knowledge transfer

D.4 Focus Group Discussion Coding Summary

Session Content Evaluation:

- Appropriate Buddhist teaching level and presentation
- Relevant health information quality and accessibility
- Balanced integration of spiritual and medical content
- Practical applicability of session activities

Group Process Assessment:

- Facilitation quality and cultural sensitivity
- Participant engagement and interaction levels
- Inclusive atmosphere and psychological safety
- Peer learning and support development

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Behavioral Change Mechanisms:

- Motivation enhancement through spiritual connection
- Skill development through practice and repetition
- Confidence building through group support
- Habit formation through structured guidance

Implementation Recommendations:

- Session timing and scheduling preferences
- Location and setting optimization
- Material and resource improvements
- Recruitment and retention strategies

Appendix E: Intervention Fidelity Monitoring

E.1 Session Observation Checklist

Observer: _____ **Date:** _____ **Session #:** _____

Rating Scale: 1=Not at all, 2=Minimally, 3=Somewhat, 4=Mostly, 5=Completely

Component	Rating	Notes
Buddhist Teaching Delivery		
Accurate presentation of Buddhist concepts	1 2 3 4 5	
Culturally appropriate language and examples	1 2 3 4 5	
Engaging delivery style	1 2 3 4 5	
Adequate time allocation (30 minutes)	1 2 3 4 5	
Health Education Component		
Evidence-based content presentation	1 2 3 4 5	
Clear, understandable explanations	1 2 3 4 5	
Interactive teaching methods used	1 2 3 4 5	
Adequate time allocation (45 minutes)	1 2 3 4 5	
Mindfulness Practice		
Proper meditation instruction	1 2 3 4 5	
Appropriate guidance during practice	1 2 3 4 5	
Conducive environment maintenance	1 2 3 4 5	
Adequate time allocation (30 minutes)	1 2 3 4 5	
Group Discussion		
Facilitated inclusive participation	1 2 3 4 5	
Maintained focus on session topics	1 2 3 4 5	
Provided supportive feedback	1 2 3 4 5	
Adequate time allocation (30 minutes)	1 2 3 4 5	

Overall, Session Fidelity Score: _____ / 80 (____%)

E.2 Home Practice Compliance Tracking

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Participant ID: _____ Week: _____ Session Topic: _____

Daily Practice Log:

Day	Meditation (min)	Mindful Eating (meals)	Physical Activity (min)	Notes
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

Weekly Reflection Questions:

1. Which practices were easiest to maintain this week?
2. What barriers did you encounter?
3. How did the practices affect your awareness or behaviors?
4. What support would help you maintain these practices?

Compliance Scores:

- Meditation: _____ days completed / 7 = _____%
- Mindful Eating: _____ meals / 21 = _____%
- Physical Activity: _____ days completed / 7 = _____%
- Overall Compliance: _____%