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Impact of a Holistic Health Intervention on the Well-Being of Elderly Thais

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Abstract

Objective: Mental stress is a major risk factor of metabolic diseases and impairs quality of life in the elderly. The goal of this study was to investigate whether a mindfulness-based intervention can improve health parameters and reduce stress-related hormones in elderly Thais.

Methods: A total of 192 participants were recruited from urban (n = 96) and rural areas (n = 96) in central region of Thailand. Creative visual art relaxation and meditative movement exemplified by Dao De Xin Xi exercise were introduced as monthly workshops and individual participants were encouraged to practice regularly for three months. General health status, levels of blood pressure (BP), fasting blood sugar (FBS), cortisol and dehydroepiandrosteone (DHEA) were evaluated before and after completing the intervention.

Results: This mindfulness-based intervention was effective as assessed by several biological health parameters. However, the degree of effectiveness differed between participants in urban and rural groups. In urban group, BPs were significantly reduced in hypertension and pre-hypertension subgroups of participants, and levels of DHEA in low DHEA participants were significantly increased after the intervention. In contrast, FBS levels in diabetic and pre-diabetic participants in the rural group, but not in the urban group, were significantly decreased after the intervention. We found a trend toward improvement of cortisol levels in both groups. However, the levels of glycated hemoglobin in either group remained unchanged.

Conclusion: This mindfulness-based intervention to elderly people improved health parameters related to metabolic diseases. Therefore, applying the intervention in primary healthcare may help promote the well-being in elderly.

Keywords: Art relaxation, Dao De Xin Xi, well-being, health promotion, elders

1. Introduction

The tremendous growth of the aging population is becoming a global health problem. According to the United Nations, the world's population aged 65 years old or over was estimated to be 728 million in 2020. In 2050, the aging population will reach 1.55 billion (Nations). Thailand has become one of the aging societies with the elderly being more than 10% of its population since 2005. By 2024, Thailand will become an 'aged society' with the elderly exceeding 20% (http://www.dop.go.th/th/know/2).

Loneliness and abandonment induced by the current stressful social environment are associated with health-related risk factors and poor quality of life in the elderly (Ong, Uchino, & Wethington, 2016; Sudnongbua, LaGrow, &

Boddy, 2010). Loneliness is an influential predictive factor for depression, impaired cognition, and development of metabolic diseases such as obesity, hypertension, heart disease and stroke, as well as high morbidity and mortality (Cacioppo, Capitanio, & Cacioppo, 2014; Yanguas, Pinazo-Henandis, & Tarazona-Santabalbina, 2018). Therefore, taking care of loneliness, its social and spiritual dimensions in combination with biological health is known as "holistic healthcare" and is vital to improving the well-being of the elderly (Strassner et al., 2019).

Mindfulness has been used to promote holistic healthcare of many diseases and has been shown to be effective for many specific conditions in elderly patients, such as age-related cognitive decline (Gard, Holzel, & Lazar, 2014), chronic pain (Kabat-Zinn, 1982; Morone, Greco, & Weiner, 2008), and psychological stress (Lenze et al., 2014; Young, Cappola, & Baime, 2009). However, applying mindfulness-based holistic healthcare in the community, where there are patients with diseases, people who are at risk to develop diseases and people with good health, has not been reported.

Creative visual art relaxation (CVAR) is a mindfulness intervention that has been used as conjunctive therapy in patients with chronic diseases such as cancer patients (Nainis et al., 2006; Walsh, Martin, & Schmidt, 2004), hemodialytic patients (Ross, Hollen, & Fitzgerald, 2006), and traumatized patients (Stuckey & Nobel, 2010). Most studies have found that CVAR improved psychological conditions, decreased negative emotions and increased positive ones, as well as reducing stress and anxiety (Stuckey & Nobel, 2010). A study in hemodialysis patients also found that CVAR helped maintain electrolyte balance and prevent weight gain (Ross et al., 2006).

Meditative movement (MM), as defined by Larkey, et al. in 2009, is a mind-body-spirit exercise that gracefully combines physical movement and mindful meditation together to achieve deep relaxation states (Larkey, Jahnke, Etnier, & Gonzalez, 2009). MM, including but not limit to Yoga, Tai Chi, Qigong, and Sign-Chi-Do, is well known for its efficacy in promoting well-being and improving quality of life in its elderly, especially those with age-related diseases (Jahnke, Larkey, & Rogers, 2010; Li et al., 2004; Rogers, Keller, & Larkey, 2010). Dao De Xin Xi (DDXX) is a modified short form of Tai Chi characterized by a smooth continuous flow-like movement with a circular manner blended with mindful meditation. DDXX was modified by a Chinese teacher, Zhao Miao Guo, from the principles of the Dao De Jing, a classical book written by Lao Zi, a Chinese philosopher. The Dao De Jing is a part of Daoist philosophy which is based on harmony between nature and human beings (Cane, 2002). Performing DDXX regularly in Thai elderly female participants has been shown to improve static and dynamic body balance, as well as to improve quality of life in terms of physical and psychological health, and social and environmental relationships (Intarakamhang & Chintanaprawasee, 2011).

This study aimed to evaluate the health-promoting effects of a mindfulness-based holistic healthcare intervention (i.e., CVAR and DDXX together with individual health consultation and provision of health literacy) on parameters of physical health and mental status in elderly communities located in urban (96 participants) and rural (96 participants) areas of the central region of Thailand. The intervention was implemented for 3 months and the parameters determined before and after intervention were evaluated to elucidate its effects on the well-being of the elderly.

2. Method

2.1 Participants

Elderly participants were recruited from the central region of Thailand: 2 communities from urban areas [from communities in Bangkok, i.e., Watcharapol (n = 15), Thung Khru (n = 28), and in the wider Bangkok metropolitan region (n = 53)]; 2 communities from rural areas [from Bangtoey, Nakhonpathom Province (n = 41) and Berkprai, Ratchaburi Province (n = 55)]. Inclusion criteria were: participants were more than or equal to 60 years old, either male or female, able to eat regularly three meals per day, able to understand Thai language, and able to attend all activities and interventions throughout the study. Exclusion criteria were: severe physical or mental illness that would affect the ability to attend the study. Persons who were diagnosed with AIDS, tuberculosis, stroke, epilepsy or severe psychological disorders were also excluded.

2.2 Procedures and Measurements

Participants were informed about what a holistic, mindfulness-based health program is. They also were informed about the details of the activities and objectives of the study. Written informed consent was obtained from all participants before the enrollment. At the beginning of the study, all participants were asked to fill out a questionnaire on demographic data including age, sex, history of illnesses, medications, health checkups, and lifestyle factors, and completed a mental health status assessment using the Thai Geriatric Depression Scale (TGDS). As baseline, general physical health parameters were measured [body weight, height, body mass index (BMI), blood pressure (BP), heart rate] and routine laboratory tests performed [fasting blood sugar (FBS),

hemoglobin A1c (HbA1c)], as well as stress-related hormones [cortisol and dehydroepiandrosterone (DHEA)]. All laboratory tests were performed at the Center of Medical Laboratory Services, Faculty of Medical Technology, which is an accredited laboratory complying with ISO 15189.

The general health and laboratory parameters were used to classify the participants into three groups: diseased, at-risk and healthy groups, based on the cut-offs in WHO guidelines.

During the three-month study period, we provided the mindfulness-based intervention, including CVAR and MM, to all participants each month and urged participants to practice both activities regularly at home. For CVAR, we used Korinka flower arrangement, which is a traditional Japanese technique of looking, feeling, expressing and confirming the arranging of flowers. For MM, we taught three steps of slow and continuous movement (of DDXX) exercise to be practiced for 15 minutes daily. The 3 steps consisted of 3 relaxing meditative movements (https://www.youtube.com/watch?v=bHUbQbAUH4I) of which a 5-minute period was used for each movement. After three months of this intervention, general physical health parameters and stress-related hormones were again evaluated and compared to the baseline levels.

This study was approved by the Mahidol University Central Institutional Review Board (MU-CIRB approval number 2018/233.0612). Participants were free to stop or withdraw themselves from the intervention for any reason.

2.3 Statistical Analysis

Data were illustrated as the mean ± standard error of the mean (S.E.M.). Statistical analyses were performed using GraphPad Prism 6.0 (GraphPad Software, La Jolla, USA). An unpaired t-test was used to analyze the differences of health parameters of subjects between those in the urban and rural groups. A paired t-test was used to analyze the differences of individual health parameters before and after the intervention.

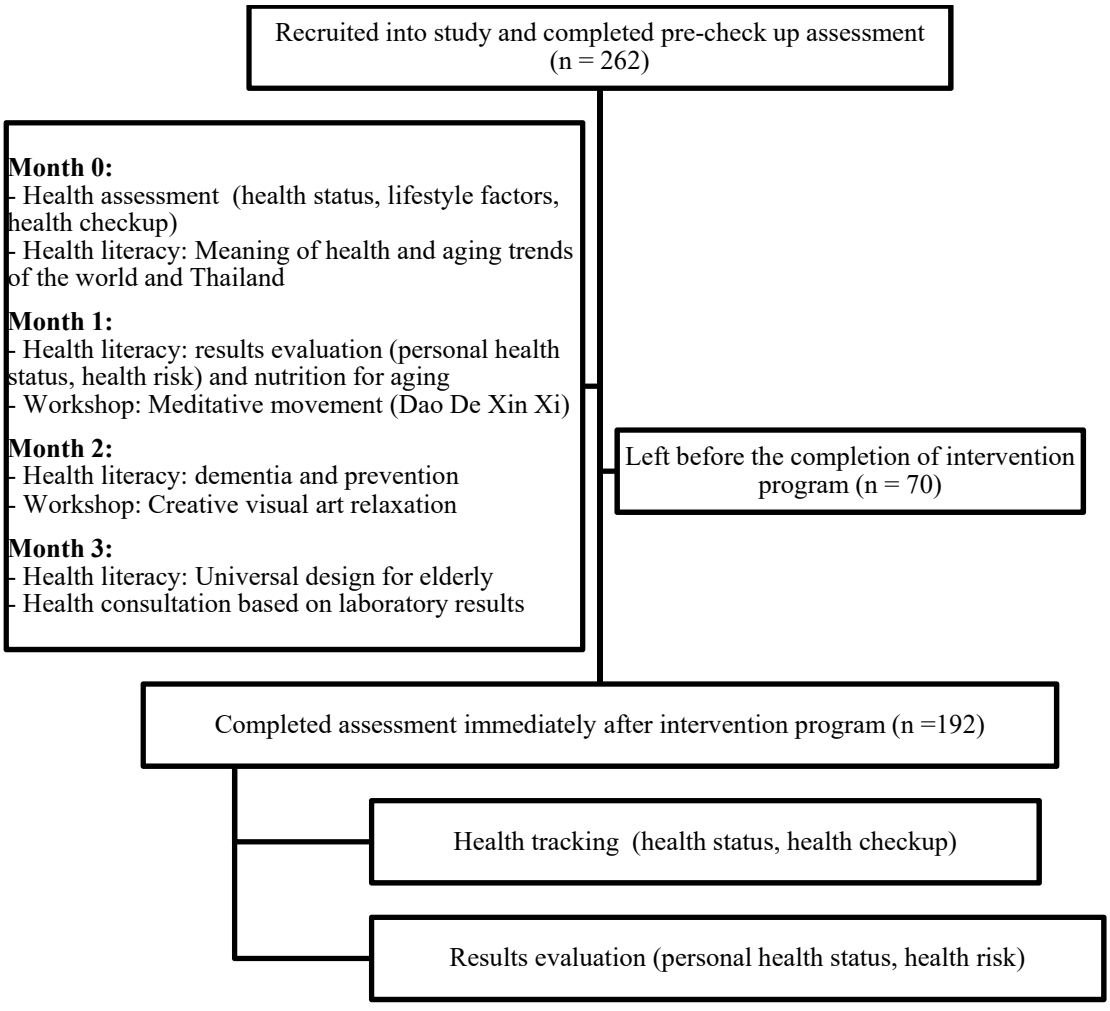

Figure 1. Study design

3. Results and Discussion

3.1 Demographic Characteristics of the Elderly Participants by Community

Table 1. Demographic characteristics of the urban and rural areas

	Urban (n = 96)	Rural (n = 96)
Sex		
Male	29 (30.21%)	21 (21.87%)
Female	67 (69.79%)	75 (78.13%)
Age		
60 – 69	73 (76.04%)	55 (57.29%)
70 – 79	22 (22.92%)	28 (29.17%)
80 – 89	1 (1.04%)	12 (12.50%)
90 – 99		1 (1.04%)
Average	69.94±6.97	66.32 ± 5.63
Underlying disease (s)		
None	19 (19.79%)	15 (15.63%)
Diabetes Mellitus	10 (10.42%)	24 (25.00%)
Hypertension	27 (28.13%)	57 (59.38%)
Others	46 (47.92%)	42 (43.75%)
Working status		
Employed	70 (72.92%)	41 (42.71%)
Unemployed	26 (27.08%)	55 (57.29%)
Family composition		
Live alone	15 (15.63%)	7 (7.29%)
With family members	76 (79.17%)	85 (88.54%)
With relatives/friends	5 (5.20%)	4 (4.17%)
Smoking habit		
Non-active	93 (96.87%)	93 (96.87%)
Active	3 (3.13%)	3 (96.87%)
Drinking habit		
Non-active	83 (86.46%)	90 (93.75%)
Active	13 (13.54%)	6 (6.25%)
Eating habit		
High-salt diet	20 (20.83%)	37 (38.54%)
Non high-salt diet	76 (79.17%)	59 (61.46%)
Depression		
Non-depressed	86.42%	93.33%
Mild	3.07%	5.19%
Moderate	3.13%	1.48%
Severe	0.00%	0.00%

Demographic data are shown in Table 1. The 192 participants were categorized into urban (n = 96) or rural (n = 96)

groups based on their recruitment location. There were 30.21% men in the urban group and 21.86% in the rural group. Female participants comprised a much larger proportion in both groups, approximately 70% and 78% from the urban and rural groups, respectively. Overall, the average age of participants did not vary among communities, with the majority being 60-79 years of age. Most of the participants had underlying metabolic diseases, including diabetes mellitus (DM) and hypertension (HT), which were the foci of this study. The prevalence of DM and HT were lower in the participants from urban compared to rural areas (10.42% vs 25.00% and 28.13% vs 59.38%, respectively). In addition, the prevalence of HT was higher than DM in both groups. Other diseases including dyslipidemia, liver disease, heart disease, anemia, asthma, gouty arthritis and allergy, which were present in 40-50% of participants were not focused on in this study. Both urban and rural groups had similar health-related risk habits. Almost none of them were active smokers nor active alcohol drinkers. In addition, depression level was assessed mainly as non-depressed in both the urban and rural groups (86.42% and 93.33%, respectively). No severe depression was found.

There were some differences in social factors between urban and rural groups including work status and family composition. While the majority of urban participants were employed, more than 50% of rural participants were unemployed and dependent on their families. In both urban and rural groups, more than 70% of participants lived with their family members. However, the number who lived alone was about two times higher in the urban group than in the rural group. The data suggested that participants in the urban group were more likely to have social stress than those in the rural group. However, the urban group were more economically advantaged than the rural group. The trends of all demographic characteristics were similar in each individual community, whether urban or rural.

3.2 Effects of Mindfulness-Based Healthcare Intervention on Blood Pressure

Psychological stress is a major cause of high blood pressure. Emotional stress leads to the activation of the sympathetic nervous system, hypothalamic-pituitary-adrenal (HPA) axis and renin-angiotensin-aldosterone (RAA) system. These release multiple hormones, such as catecholamines, corticosteroids and renin, that elevate blood pressure (Black & Garbutt, 2002). Long-term psychological stress can lead to loss of the homeostasis which brings BP back into the normal range (Cuevas, Williams, & Albert, 2017; Spruill, 2010). Mindfulness meditation for 8 weeks has been shown to reduce stress and blood pressure in hypertensive patients in a Mediterranean population (Ponte Marquez et al., 2019). Since CVAR and MM share a basic concept with meditation, we hypothesized that applying these activities would reduce blood pressure in the elderly.

In this study, we compared the effects of a mindfulness-based intervention on systolic blood pressure (SBP) and diastolic blood pressure (DBP) in participants from urban and rural groups. We found that SBP tended to decrease in the urban, but not in the rural, group after the intervention (Figure 2 A and E). However, by categorizing the participants based on their BP before applying the intervention [hypertension (HT: SBP $\geq$ 140 or DBP $\geq$ 90 mmHg), pre-hypertension (pre-HT: 130 $\leq$ SBP < 140 or 80 $\leq$ DBP < 90), and normal blood pressure (NBP: SBP < 130 or DBP < 80) subgroups] we found that the intervention significantly reduced SBP in the HT subgroup, both in urban and rural participants (Figure 2 B and F). The intervention only significantly reduced SBP in pre-HT participants of the urban but not of rural group (Figure 2 C and G). In contrast to HT and pre-HT subgroups, the intervention led to slight but significant increases in SBP in the NBP subgroup of both urban and rural groups (Figure 2 D and H).

In contrast to SBP, the effect of the intervention was greater on DBP. It significantly reduced DBP among participants of the urban but not rural group. The DBPs of HT and pre-HT subgroups of urban participants were significantly decreased after the intervention (Figure 2 A, B and C). However, the intervention significantly reduced DBP only in the pre-HT participants from the rural group (Figure 2 G).

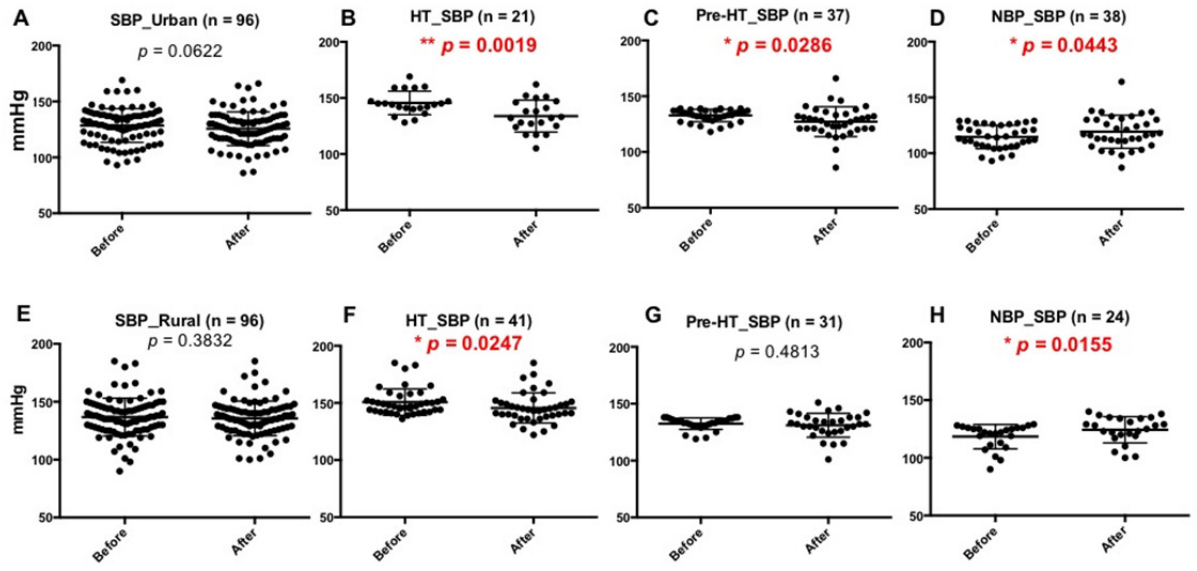

Figure 2. Effect of mindfulness-based intervention on blood pressure. Systolic (1) and diastolic (2) blood pressure in urban (A) and rural (E) groups. Blood pressure of participants with hypertension (B and F), prehypertension (C and G) and normal (D and H). Significant differences were observed between before (baseline) and after intervention as determined by paired-sample t-tests. The results are expressed as mean ± SEM. *p<0.05, **p<0.01 and ****p<0.0001 compared with baseline

High-salt diets are a major factor causing hypertension (He & MacGregor, 2011). A reason why the mindfulness-based intervention was more effective in the urban than rural group might be the difference in eating habits, that more participants in the rural group (37-40%) tended to eat a high-salt diet than in the urban group (10.71–26.67 %) as shown in Table 1.

These data suggested that this mindfulness-based intervention gave an advantage to the participants in reducing SBP and DBP.

3.3 Effects of Mindfulness-Based Healthcare Intervention on Blood Sugar

Sympathetic nervous system activation during psychological stress impacts glycemic control, especially during the postprandial state (Faulenbach et al., 2012). However, the effects of stress reduction on fasting blood sugar (FBS) and glycated hemoglobin (HbA1c) remains unknown.

We compared the effects of a mindfulness-based intervention on FBS and HbA1c in participants from urban and rural settings, thus different social environments. We categorized the participants based on their levels of FBS and HbA1c before starting the intervention. The participants who had FBS ≥ 126 mg/dL or HbA1c ≥ 6.5% were classified as the Diabetic Mellitus (DM) group. Those who had 100 < FBS < 126 or 5.8 ≤ HbA1c ≤ 6.4 were classified as the pre-DM group. Those with FBS ≤ 100 or HbA1c < 5.8 were classified as the normal group. We found that the intervention had a prominent effect in reducing FBS in the rural participants, both in the DM and pre-DM subgroups (Figure 3 E-G). In urban participants, FBS tended to decrease in both the DM and pre-DM subgroups but the differences were not statistically significant (Figure 3 B and C). The intervention had no effect on FBS levels in the normal subgroups.

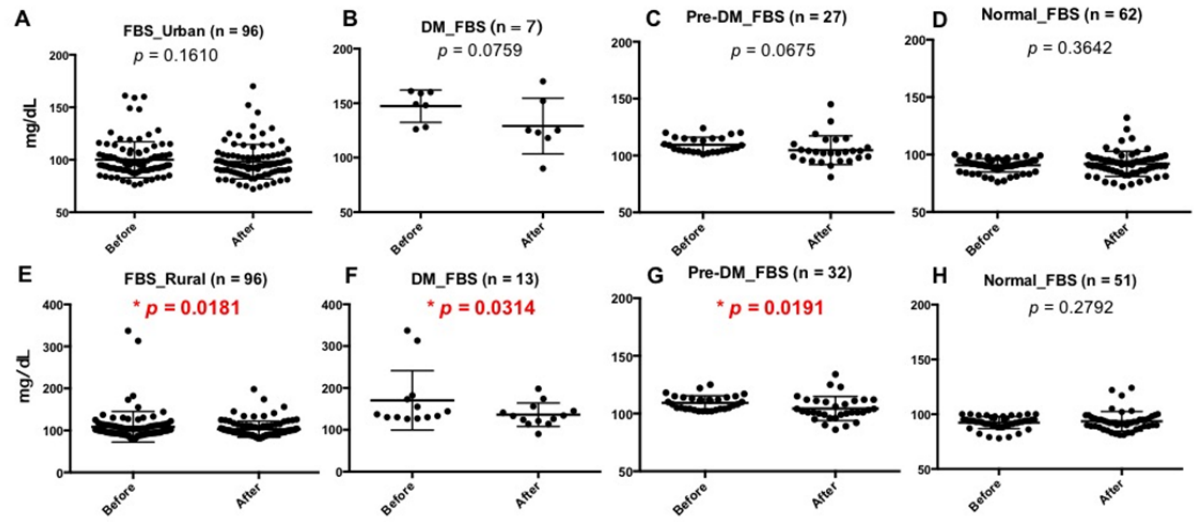

Figure 3. Effect of mindfulness-based intervention on FBS. FBS level in urban (A) and rural (E) areas. FBS of participants with DM (B and F), pre-DM (C and G) and normal (D and H). Significant differences were observed between before (baseline) and after the intervention as determined by paired-sample t-tests. The results are expressed as mean ± SEM. *p<0.05, compared with baseline

HbA1c levels, determined before and after intervention, were unchanged in the DM and pre-DM subgroups in the urban and rural groups. However, in the normal subgroups HbA1c levels were slightly but significantly higher after the intervention (Figure 4).

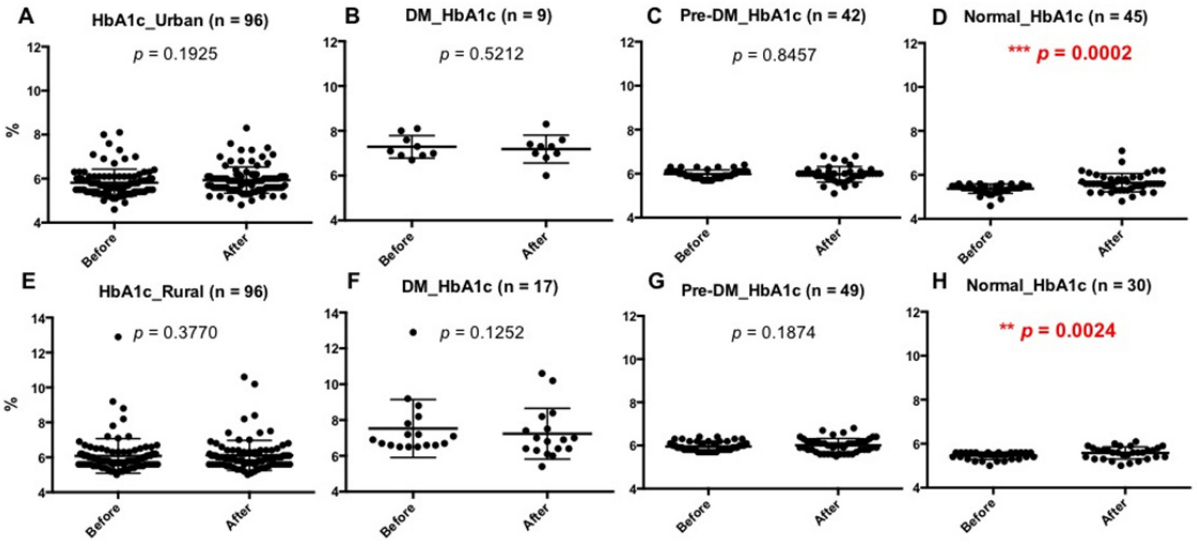

Figure 4. Effect of mindfulness-based intervention on HbA1c. HbA1c levels in urban (A) and rural (E) areas. HbA1c of participants with DM (B and F), pre-DM (C and G) and normal (D and H). Significant differences were observed between values determined before (baseline) and after intervention using paired-sample t-tests. The results are expressed as mean ± SEM. **p<0.01, compared with baseline

These data suggested that applying a mindfulness-based intervention for 12 weeks had a short-term effect on blood glucose levels in DM and pre-DM participants. However, determining the duration of this effect on blood glucose will require further investigation.

3.4 Effects of Mindfulness-Based Healthcare Intervention on Stress-Related Hormones

Cortisol and DHEA are two stress-related hormones released from the adrenal cortex in response to adrenocorticotropic hormone. Cortisol and DHEA levels are highly related to psychological and neurological

disorders. For example, high levels of morning cortisol are associated with development of major depressive disorder (Goodyer, Herbert, Tamplin, & Altham, 2000; Harris et al., 2000). High cortisol is also correlated with disease progression in patients with Alzheimer-type dementia (Csernansky et al., 2006). In contrast, low morning cortisol is associated with prolonged psychological stress and transient HPA axis suppression (Zarkovic et al., 2003). Low DHEA levels are associated with aging, prolonged psychological stress, and perceived stress at work (Lennartsson, Theorell, Rockwood, Kushnir, & Jonsdottir, 2013).

In this study, we categorized the participants based on their initial levels of cortisol into three subgroups [high cortisol (> 18.4 µg/dL), normal cortisol (6 - 18.4 µg/dL) and low cortisol (< 6 µg/dL)] and compared the subgroup levels before and after the mindfulness-based intervention. We found a small number of participants who had abnormal cortisol levels. There were only three participants from the urban group and eight from the rural group who had high cortisol levels. Likewise, there were only four participants from the urban group and seven from the rural group who had low cortisol levels. The paired data for each of these individuals is shown as line graphs (Figure 5 B, C, F, and G). Comparing before and after the mindfulness-based intervention, we found that cortisol levels tended to decrease in the high cortisol subgroups and increase in the low cortisol subgroups among both urban and rural participants (Figure 5 B, C, F, and G). The intervention had no effect on cortisol levels in the normal cortisol subgroups. Might the intervention's effect on cortisol have been a marker for reduced stress? One meta-analysis reported that mindfulness does not significantly change cortisol level (Carlson, Speca, Faris, & Patel, 2007; O'Leary, O'Neill, & Dockray, 2016). On the other hand, in some studies mindfulness mediation is significantly associated with decreases in blood cortisol levels (Lengacher et al., 2019; Turakitwanakan, Mekseepralard, & Busarakumtragul, 2013). However, cortisol and IL-6 are positively associated with depression, anxiety and sleep disorders. Our data suggested that this mindfulness-based intervention helped to balance cortisol levels, bringing abnormal cortisol levels back toward the normal range.

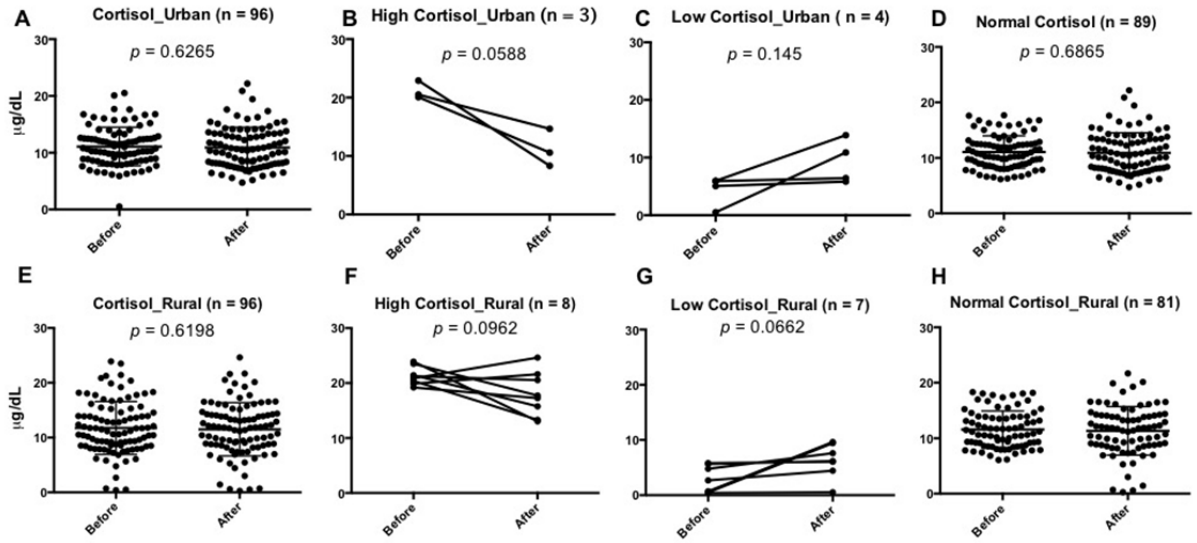

Figure 5. Effect of mindfulness-based intervention on serum cortisol levels. Cortisol levels in urban (A) and rural (E) groups. Cortisol levels of participants with high cortisol (B and F), low cortisol (C and G) and normal cortisol (D and H). Significant differences were observed between before (baseline) and after intervention specimens as determined by paired-sample t-tests. The results are expressed as mean ± SEM

Comparing DHEA levels between the urban and rural groups, we found a significantly lower level of DHEA in the rural group ($p < 0.0001$) as shown in figure 6. This difference in DHEA levels might reflect a higher level of prolonged psychologic stress in elderly residing in rural compared to urban areas. By categorization of participants into two subgroups [low DHEA (< 80 µg/dL) and normal DHEA (80–560 µg/dL)], we found that the intervention was significantly associated with increased DHEA levels in the low DHEA subgroup of urban but not rural participants. Interestingly, low levels of DHEA are reported to be associated with stress.

The data suggested that this mindfulness-based intervention reduced stress in the elderly who lived in urban, but not rural, areas (Zarkovic et al., 2003).

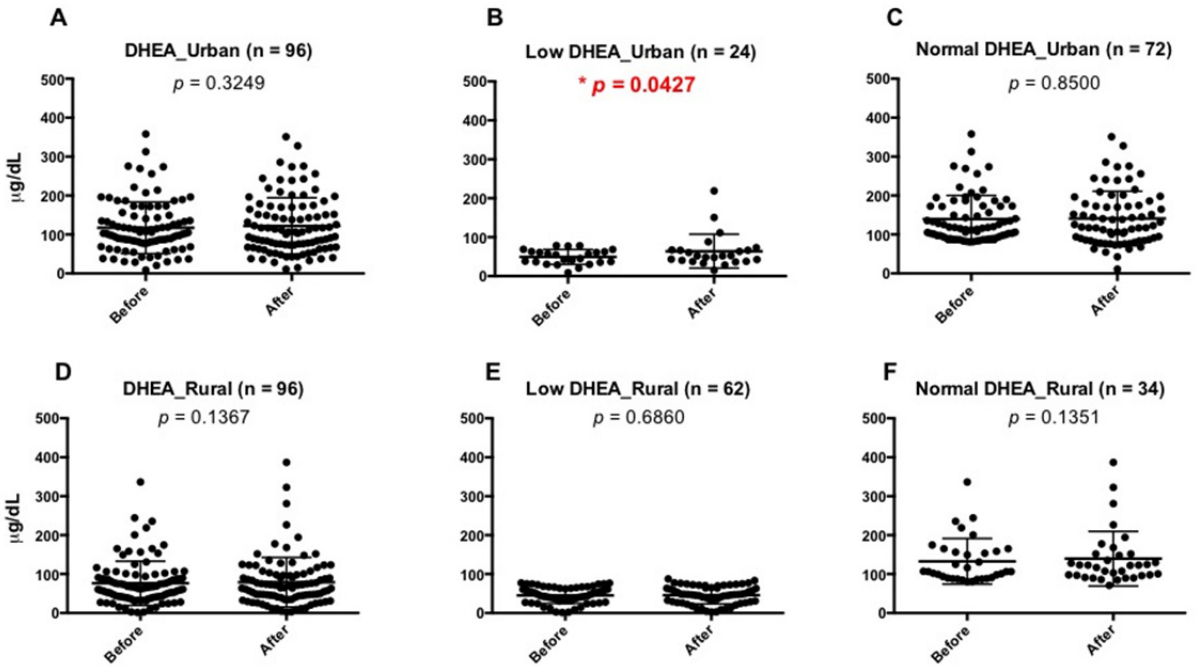

Figure 6. Effect of mindfulness-based intervention on DHEA levels. DHEA levels in urban (A) and rural (D) areas. DHEA levels of participants with low DHEA (B and E) and normal DHEA (C and F). Significant differences were observed between before (baseline) and after intervention as determined by paired-sample t-tests. The results are expressed as mean ± SEM. *p<0.05, compared with baseline

4. Conclusion

Our study revealed that application of a mindfulness-based intervention for three months to elderly people in urban and rural communities in Thailand impacted several biological health parameters, reducing risk factors of metabolic diseases, including HT and DM. Moreover, the intervention also reduced stress-related hormones. Mindfulness-based holistic interventions are not complicated and can be practiced by the elderly at home. Training healthcare workers in primary healthcare units to educate elderly people in the community about this intervention is likely to promote well-being in older adults.

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Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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