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Original Research Article

Effect of the mindfulness-based program on stress, anxiety and physiological changes among nurse aid students attending the 9 months course of nurse aid training in Myanmar

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ABSTRACT

Background: Suffering under stress and anxiety was a big challenge for the majority of nurse aid students and it was requisite to pass the 9 months training without attrition to become a qualified nurse aid.
Methods: From 1st week of February to 4th week of May, 2023, 104 nurse aid training students (51 participants in intervention group and 53 participants in control group) from 7 tertiary hospitals in the Yangon Region were conducted by a quasi-experimental study. Data collection was done by asking questionnaire for stress and anxiety, and by collecting blood samples to test serum cortisol level. Data was analysed by using SPSS 23 and independent t-test, one-way repeated measures ANOVA and multiple linear regression with propensity score adjustment were applied.
Results: The mean changes (before- after- followed up) in the Perceived Stress Scale (PSS) and in the Generalized Disorder Scale (GAD) were significantly different between the intervention and control groups displaying a difference in difference mean change of 4.13 (2.41, 5.86) at p<0.001, 3.02 (95%CI: 1.05, 4.99) at p=0.003 and that of 2.45 (95% CI: 1.24, 3.66), p<0.001, 1.49 (95%CI: 0.16, 2.83) at p=029 respectively. Moreover, there was a significant decrease (before-after 8 week intervention) in the serum cortisol level between two groups showing a difference in difference mean change of 39.66 (95% CI: 4.97, 74.34), p=0.026.
Conclusions: This study might observe as supportive evidence of the mindfulness-based program to manage stress and anxiety among nurse aid students.

Keywords: Mindfulness-based program, Stress, Anxiety, Serum cortisol, Nurse aid students

INTRODUCTION

Facing high level of stress and anxiety was a huge challenge for health care providers including nurses' populations. Clinical care was being provided to patients across all hospitals in Myanmar with a shortage of nursing care cadres. The Ministry of Health, Myanmar has initiated a nurse aid training program since January, 2021 to fulfil the gap of nurse requirement in hospital setting. Nurse aid students have got a completion certificate only after 9 months training program without attrition under the Department of Medical Services meanwhile nursing students have graduated the diploma in nursing after the completion of 3 years course under Nursing and Midwifery Schools, the Ministry of Health. The fastest and shortest method to recruit nursing categories in current man power situation was to establish nurse aid students' population. The majority of nurse aid students suffered under stress

and anxiety to go forward into in-service at Government/Public Hospitals. One study revealed that 50.2% of nurses had high stress and tendency to burnout nevertheless the other study reported that 63.6% of nurses intended to remain employed at hospitals in the Yangon Region in Myanmar.[1,2]

The majority of literature mentioned the findings related to reduce stress and anxiety were associated obviously with the mindfulness-based program. The mindfulness-based program for 8 week duration was effective on reducing stress and anxiety among 16 nursing students.[3] The study to evaluate the effectiveness of 8 week online mindfulness-based program was conducted among 26 nursing students and the researcher pointed out that there was a dramatic decreasing in levels of anxiety and stress.[4] In Jordan, a randomized control trial was conducted among 108 nursing students and the results showed that mindfulness meditation was significantly effective in decreasing serum cortisol level and perceived stress after five 30 minute weekly sessions of mindfulness meditation.[5] Because of the effect of mindfulness on stress and anxiety, many researchers argued for nursing populations particularly as an output of academic training and clinical related procedures. The mindfulness-based program was a potential solution to manage stress and anxiety with a good working result. This was an introduction of the mindfulness-based program to nurse aid training students who would be able to cope with whatever stress and anxiety they have to face during their training. By doing so they could finish the 9 months training program without any dropouts and expected to come into in-service at the public hospitals. This study was aimed to determine the effect of mindfulness-based program on stress, and anxiety before, after 8-week intervention and after 8 week followed up, and serum cortisol level before and after intervention among nurse aid students.

METHODS

A quasi-experimental study was conducted among 104 nurse aid students (51 participants in the intervention group and 53 participants in the control group) at the 7 tertiary hospitals in Yangon Region from 1st week of February to 4th week of May, 2023. Inclusion criteria were both gender, students who were under training in 5 tertiary hospitals as the intervention group and students who were under training in 2 tertiary hospitals as the control group. Exclusion criteria were anyone who had already done a mindfulness-based procedure more than once per month for the previous six months and who had experienced daily regular aerobic physical exercise more than four days a week for the previous six months, anyone who unfitted to do moderate intensity of aerobic physical exercise and anyone who had been taking drugs that made changing serum cortisol level.

The sample size was calculated by G*Power (3.1.9.1). To determine effect of the mindfulness-based program on Perceived Stress Scale (PSS), the minimum 9 participants in each group was needed by calculating for a power of 0.80, effect size of 1.426, alpha 0.05, two tailed independent t test and $N^2/N^1=1$. In addition, for Generalized Disorder Scale (GAD) analysed by a meta-analysis, the minimum 41 participants in each group was needed for a power of 0.80, effect size of 0.637, alpha 0.05, two tailed independent t test and $N^2/N^1=1$. Finally, to determine for changing of serum cortisol level, the minimum 42 respondents in each group was needed for a power of 0.80, two tailed, effect size 0.62, alpha 0.05, allocation ration $N^2/N^1=1$ with independent sample t test.[9] However, researcher recruited 51 participants to intervention group and 53 participants to control group in order to compensate potential dropout rates. The Yangon Specialty Hospital, the New Yangon General Hospital, the Yangon Children Hospital, the Central Women Hospital and the Yangon West Hospital (5 hospitals in intervention group) and the Insein General Hospital and the Yangon General Hospital (2 hospitals in control group) were selected by purposive sampling among 13 tertiary hospitals within the Yangon Region where nurse aid training had been conducting since December, 2022 and January, 2023.

Intervention package

Intervention package for a total of 8 weeks was adapted according to previous literature (Table 1).[10-12]

Table 1: Intervention package.

S. no.	Mindfulness-based program (each week)
	Formal practice
1	Daily 1-hour meditation for 3 days
2	Daily 30-minute aerobic physical exercise for 3 days
3	30-minute group discussion for 1 day
	Informal practice
4	Daily home practice (mindful eating and mindful movement) for 7 days
Same program from week 1 to week 8 and followed up 8 weeks for only informal practice	

Adapted intervention package.[10-12]

The contents of meditation section were adapted according to instructions from the Meditation Center (Thekata, Yangon, Branch 32) together with components of meditation.[10-12] The well experienced six instructors from the Meditation Center (Thekata, Yangon, Branch 32) came to the Specialty Hospital, Yangon where all participants from five hospitals in the intervention group gathered. They trained and supervised closely each participant during 1 hour meditation session from 7 am to 8 am for every Thursday, Friday and Saturday a week for a total of 8 weeks.

Aerobic exercise is a physical exercise of relatively low intensity that depends originally on the oxygen producing process and it consists of exercises such as warm up, physical activity and cool down.[13] Before conducting

aerobic physical exercise, pre-exercise screening was done by using 7-items adults pre-exercise screening tool that was a set of 'yes' or 'no' question.[14] If a candidate gave 'yes' answer to any of 7 questions, he or she proceeded to consult with a physician prior to undertaking aerobic physical exercise. Before undergoing the moderate intensity aerobic physical exercise, the general conditions and vital signs were measured and Electrocardiogram (ECG) for individuals was assessed to detect any abnormities by a medical officer. If both vital signs and ECG were found to be within normal and a candidate gave 'no' answer to all of 7 questions, he or she proceeded to undertake the moderate intensity aerobic physical exercise.[14] The pre-tested moderate intensity aerobic physical exercise was the 5-minute aerobic exercise program with music.[15] The supervised aerobic physical exercise program consisted of 30 minute session, low to moderate intensity exercise with music on three consecutive days per week for 8 weeks duration according to FITT principle (F-frequency, I-intensity, T-time, and T-type of exercise).[16] The two well experienced trainers from Department of Sports and Physical Education, Yangon Region came to the Specialty Hospital, Yangon where all participants from Five hospitals in the intervention group were collected, for supervision 30 minute aerobic physical exercise session from 7 am to 7:30 am for every Monday, Tuesday and Wednesday a week. The 30-minute group discussion was conducted every Sunday morning.

Only those who had completed overall attendance (more than 51 days out of total 56 days) 91.07% of overall compliance, meditation hours attendance (more than 21 hours out of total 24 hours) 91.66% of compliance of meditation hours, aerobic physical exercise hours attendance (more than 11 hours out of total 12 hours) 91.66% of compliance of aerobic physical exercise hours, group discussion hours attendance (more than 3.5 hours out of total 4 hours) 87.5% of compliance of group discussion hours were chosen to allow to undergo data analysis concerning compliance of intervention package as formal practice. Otherwise, those who were not met with these criteria, were categorized as drop outs.

The PSS was a 10-item 5-point Likert scale (0=never to 4=very often) pointing out higher score represents higher stress level and Cronbach's alpha was 0.83.[17,18] The GAD was a seven-item scale designed to measure anxiety symptoms answering the questions regarding how frequently they have been felt by mental problems during the previous two weeks.[19] Based on total scoring (0-21), the higher marks indicated more severe anxiety with Cronbach's alpha =0.87.[20] English version was translated to Myanmar language and next, the approval was requested to English Department and Psychological Department from Monywa University and also from Mental Health Unit of the Monywa General Hospital. Pre-test was conducted with 10 nurse aid training students from the Thingangyun Sanpya General Hospital, Yangon and the overall questionnaire was revised accordingly before collection.

Prior to data collection, two sisters and two senior nurses from the Specialty Hospital, Yangon were recruited and trained as data collectors. They were received two-day training by principal investigator for collecting socio-demographic characteristics and assessing questions for outcome variables and blood samples.

Before the 8-week intervention, all participants from both intervention and control groups answered the questionnaires related to PSS and GAD and additionally, about 2-3 ml of whole blood was drawn from a vein under aseptic condition on 8 am by trained data collector team members. Before one day to blood collection, participants were notified to restrict alcohol consumption, vitamin C supplementation (including juices), milk, salty diet and caffeine intake before 12 hours (double of gastric emptying time 4-6 hours) of scheduled blood collection time. After assessing the compliance of these restrictions, the baseline serum cortisol levels were measured by standard sample collection method and sent to the National Health Laboratory, Yangon, by ensuring standard transportation procedures.

The intervention group were proceeded the 8-week intervention package meanwhile the control group were allowed for routine activities.

After the 8-week intervention and the 8-week followed up, all participants from the intervention and control groups answered the same questionnaires related to PSS and GAD. And only after the 8-week intervention, the blood testing was repeated to assess serum cortisol level following the same procedures as before.

Data analysis was done by using IBM SPSS version 23. The mean changes of PSS and GAD were assessed by one-way repeated measures ANOVA before and after intervention, and after followed up within the intervention group and the control group. Independent sample t test was calculated to identify the mean difference changes of PSS, GAD and serum cortisol level before and after 8 week intervention, and to determine mean difference of PSS and GAD before 8-week intervention and after 8 week followed up between the intervention group and control group. After bivariate analysis, checking the assumptions for multiple linear regression, checking the outliers and multiple linear regression adjusting propensity score was applied.

RESULTS

Baseline data of 104 (51 intervention group and 53 control group) participants was collected on 1st week of February, 2023. The mindfulness-based program was conducted from 1st week of February to 4th of March, 2023 for total 8 weeks' duration. After intervention, outcome assessment was done at the end of March, 2023. Because of compliance rate <91%, 9 participants were regarded as loss to follow up and 42 participants who had completed compliance rate ≥91%, were eligible for data analysis in

the intervention group. Because of loss to follow up (refuse to participant, n=5) and 48 participants were eligible for data analysis in control group. The follow up period was from 1st week of April to 4th week of May, 2023 and the end line data (42 in intervention and 48 in control) was collected on 1st week of June, 2023 after followed up for a total of 8 week (Figure 1).

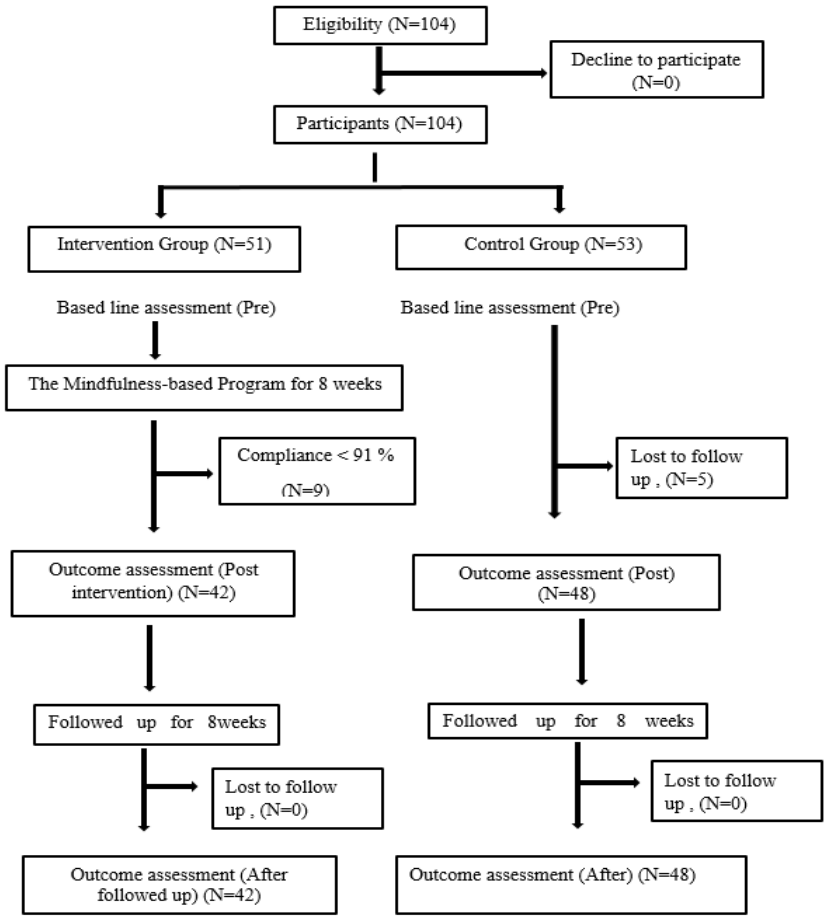

Figure 1: Quasi-experimental study with a non-equivalent control group pre-test-post-test design.

Table 2: Demographic characteristics of study population of both groups.

Demographic characteristics	Intervention (n=42) N (%)	Control (n=48) N (%)	Total (n=90) N (%)	P value
Age (years)				
<20	15 (35.7)	16 (33.3)	31 (34.4)	0.813
≥20	27 (64.3)	32 (66.7)	59 (65.6)	
Sex				
Male	7 (16.7)	7 (14.6)	14 (15.6)	0.786
Female	35 (83.3)	41 (85.4)	76 (84.4)	
Education				
High school	19 (45.2)	35 (72.9)	54 (60.0)	0.007
University/graduate	23 (54.8)	13 (27.1)	36 (40.0)	
Race				
Bamar	31 (73.38)	48 (100)	79 (87.8)	<0.001
Others	11 (26.2)	0 (0)	11 (12.2)	
Religion				
Buddhist	42 (100)	48 (100)	90 (100)	-
Residence				
Urban	9 (12.4)	19 (39.6)	28 (31.1)	0.72
Rural	33 (78.6)	29 (60.4)	62 (68.9)	

Out of 90 participants, median age was 20 years and regarding sex, 7 (16.7%) males and 35 (83.3%) females in the intervention group, and 7 (14.6%) males and 41 (85.4%) females were involved in the control group (Table 2).

The (PSS) was significantly reduced from 15.95 before intervention to 12.69 after intervention at p<0.001 and also significantly decreased from 15.95 before intervention to 13.6 after followed up at p=0.003 with one-way repeated measures ANOVA. Similarly, the GAD was statistically reduced from 5.88 before intervention to 4.07 after intervention at p<0.001 and also decreased from 5.88 before intervention to 4.76 after followed up but it was not statistically different at p=0.052. Additionally, there was a significant difference in the mean change of serum cortisol, 45.29 nmol/l [95%CI: 19.16, 71.42] at p value =0.001, within the intervention group before and after 8-week intervention (Figure 2).

The mean change in PSS before and after 8-week intervention was significantly different within the intervention group showing a mean change of 3.26 (95%CI: 2.33, 4.19) p<0.001. Additionally, the mean change in PSS after intervention and after 8-week followed up was differed significantly within the intervention group displaying a mean change of 2.35 (95%CI: 0.84, 3.87) p=0.003. The mean change in GAD before and after 8-week intervention was significantly different within the intervention group showing a mean change of 1.81 (95%CI: 0.92, 2.70) p<0.001 (Table 3).

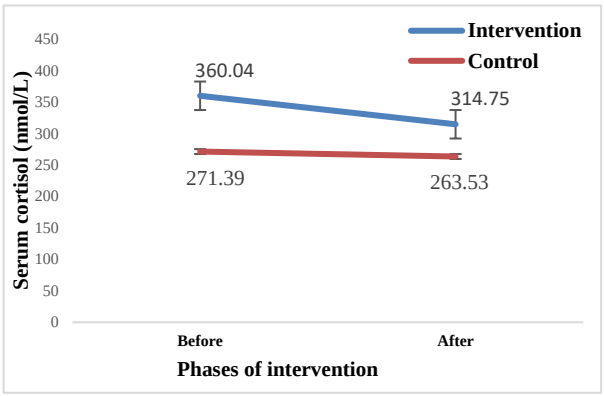

Figure 2: Mean changes of serum cortisol level before and after intervention for both groups.

Table 3: Comparison of mean scores of PSS and GAS among before intervention, after intervention and followed up within the intervention group applying one-way repeated measures ANOVA.

	Intervention (n=42)			P value
	Diff in Mean [95% CI]			
	Time 1 vs time 2	Time 1 vs time 3	Time 2 vs time 3	
PSS	3.26 [2.33, 4.19]	2.35 [0.84, 3.87]	-0.91 [-2.29, 0.47]	P^a=<0.001 P^b=0.003 P^c=0.192
GAD	1.81 [0.92, 2.70]	1.12 [-0.01, 2.25]	-0.69 [-1.60, 0.22]	P^a<0.001 P^b=0.052 P^c=0.135

PSS= Perceived Stress Scale; GAD= Generalized Anxiety Scale; Time 1 vs Time 2= Between before intervention and after intervention; Time 1 vs Time 3= Between before intervention and after followed up; Time 2 vs time 3= Between after intervention and after followed up; P^a= p value for time 1 vs time 2; P^b= p value for time 1 vs time 3; P^c= p value for time 2 vs time 3.

Table 4: Mean difference of PSS, GAD and serum cortisol before and after intervention between two groups.

Scale	Intervention (n=42)	Control (n=48)	Diff in Diff Mean [95% CI]	Independent t test P value
	Mean Diff (SD)	Mean Diff (SD)		
PSS	3.26 (2.97)	-0.87(4.87)	4.13[2.41,5.86]	<0.001
GAD	1.81(2.86)	-0.65(2.89)	2.45[1.24,3.66]	<0.001
Serum cortisol (nmol/l)	45.29(83.87)	5.64(81.47)	39.66[4.97 ,74.34]	0.026

PSS= Perceived Stress Scale; GAD=Generalized Anxiety Scale.

Regarding comparisons of difference in mean scores of PSS and GAD and serum cortisol, before and after intervention between intervention and control groups, the mean change in the PSS was differed significantly explicating a difference in difference mean change of 4.13 [95%CI: 2.41, 5.86] at p<0.001. Similarly, there was a significant difference in the GAD displaying a difference in difference mean change of 2.45 [95%CI: 1.24, 3.66] at p<0.001. Moreover, the mean change in the serum cortisol level was statistically significant between intervention and control groups exhibiting a difference in difference mean change of 39.66 (95%CI: 4.97, 74.34) at p=0.026 (Table 4).

Concerning comparisons of difference in mean scores of PSS and GAD before 8-week intervention and after 8-week followed up between intervention and control groups, the mean changes in the PSS and the GAD were

significantly different explicating a difference in difference mean change of 3.02 [95%CI: 1.05, 4.99] at p=0.003, and 1.49 [95%CI: 0.16, 2.83] at p=0.029 respectively.

Table 5: Multiple linear regression on mean difference of PSS before and after intervention 8-week by propensity score between two groups.

Variables	B	S.E	t	95%CI	P value
Groups (intervention, control)	-4.91	0.99	-4.96	-6.88, -2.94	<0.001
Propensity score	3.15	2.00	1.57	-0.83,7.13	0.120

R^2=0.21, VIF<5.

Table 6: Multiple linear regression on mean difference of GAD scale before and after intervention 8-week by propensity score between two groups.

Variables	B	S.E	t	95%CI	P value
Groups (intervention, control)	-2.65	0.65	-4.05	-3.95, -2.1.35	<0.001
Propensity score	1.50	1.80	0.89	-2.09,5.09	0.41

R^2= 0.16, VIF<5.

Table 7: Multiple linear regression on mean difference of serum cortisol before and after intervention 8-week by propensity score between two groups.

Variables	B	S.E	t	95%CI	P value
Groups (intervention, control)	-34.99	18.77	-1.86	-72.29, 2.31	0.004
Propensity score	-35.73	51.94	-0.68	-138.97,67.51	0.49

R^2=0.03, VIF<5.

After adjusting propensity score, the mean changes (before and after 8-week intervention) in PSS was statistically different between intervention and control groups at p<0.001 (Table 5). Similarly, the mean changes (before and after 8-week intervention) in GAD was differed significantly with propensity score between two groups at p<0.001 (Table 6). Moreover, there was a significant difference in mean changes of serum cortisol level between two groups (before and after 8-week intervention) with propensity score at p= 0.004 (Table 7).

DISCUSSION

In the present study, there was a significant reduction in the perceived stress level after 8-week intervention and after followed up 8-week between intervention group and control group. It indicated that this study could assess both the immediate and longer-term impact of the intervention by comparing before intervention, after intervention, and follow up findings. Moreover, the intervention group could maintain a significant reduction in stress level after 8 weeks of follow up, it pointed out that the effects of the intervention were durable, extending beyond the intervention period and 8-week intervention had both immediate and sustained benefits for nurse aid students. This might suggest that the skills and methods learned during the intervention had a lasting impact, helping participants coped with stress after the intervention concluded. The other studies have been shown the similar findings, with similar populations such as registered nurses at Robert Morris University, Pennsylvania, nursing students at the University of São Paulo, Brazil, nursing students at Midwestern University, United States of America and nursing students who completed a 4-week online mindfulness intervention.[21-25]

Another relevant finding was a significant reduction in anxiety level after 8-week intervention between the intervention group and the control group. A significant reduction in anxiety levels after 8-week intervention pointed out that the intervention had a beneficial impact on reducing anxiety. This could be due to specific components of the intervention, such as aerobic physical exercises, mindfulness techniques and peer group discussion. Additionally, the reduction in anxiety after intervention indicated the immediate impact of the 8-week intervention during an active intervention period. This finding was consistent with the previous studies such as the studies undertaken among nursing students in Korea, China and Iraq.[26-28]

The most relevant finding was that there was a significant reduction about 6 times of the serum cortisol level in the intervention group with compared to control group. This obviously reflected that the mindfulness-based program was found to be effective to reduce the serum cortisol level among the nurse aid students. This finding was similar to that of the multiple studies on similar populations such as nurses at the University of New Mexico Health Sciences Centre, medical students from Srinakharinwirot University, Thailand, nursing students from Jordan University and on different population, male wrestlers, Iran.[29-31] In general, a decreasing trend in serum cortisol among nurse aid students might be probably due to reduced stress, improved coping techniques, and better adaptation

to the training environment. Cortisol, "stress hormone," is produced by the adrenal glands and plays a significant role in stress response.[32] Because of mindfulness meditation and regular exercise, which might be influencing factors in regulation of cortisol, serum cortisol level was obviously reduced after intervention. It was found that the mean-base line serum cortisol level in the intervention group was greater than that of control group and it might be due to individual variation of nurse aid students.

In this study, it was found that the mean changes (before - after 8-week intervention) in PSS, GAD and serum cortisol level were significantly different between intervention and control groups. Those findings were similar to that of nursing students in the nursing and midwifery school of Isfahan University of Medical Sciences, Iran ,and that of nursing students from Kempegowda Institute of Nursing, Bengaluru, Karnataka, India and that of nursing students in the Middle East and North Africa region by systematic review and that of nurses and health care professionals from community-the southwestern United States.[33-37] A significant reduction in stress and anxiety indicated that participants experienced a noticeable decrease in their psychological stress and anxiety symptoms resulting a lower sense of worry, improved emotional regulation, or increased relaxation. Cortisol is a biomarker of physiological stress commonly associated with the body's stress response system. A significant reduction in serum cortisol level suggested that participants not only felt less stress but also experienced a physiological response to the mindfulness-based program. Therefore, those findings showed that the mindfulness-based program was effective to reduce stress, anxiety and also serum cortisol level. Particularly to this study, reduced stress and anxiety could improve training performance, basic clinical skills, good understanding to patients, sympathy to patients and emotional well-being, which were crucial for nurse aid students.

Overall, a significant reduction in stress, anxiety, and serum cortisol levels after a mindfulness-based program revealed that the intervention had a positive meaningful and beneficial impact on psychological and physiological aspects of stress response. This finding was encouraging for the use of mindfulness practices as part of a holistic approach to manage stress and anxiety management. This finding also had implications for improving nurse aid education and supporting students in high-stress fields in different populations.

There were some limitations in this study. First, the reasons why unbalanced mean scores in PSS, GAD and serum cortisol before intervention between the intervention and control groups might be different background such as educational level, types of hospital under which they trained (general or specialty) and location of hospital such as downtown or suburban. Second, the current research results were limited to the nurse aid students who have been trained under the tertiary hospitals in the Yangon region because of purposive sampling method and so, it may not be generalized to nurse aid students from all States and Regions from Myanmar. Third, the questionnaire used in this study were self-reported tools, and the data were limited to the answers given by the nurse aid students. Finally, although the principal investigator, the nursing superintendent, matron and sisters have been working at same hospital surroundings, no obligation or enforcement about their participation was given. The principal investigator and team have already explained about a very clear-cut partition between completion certificate of 9 months training program and selection of participant and the researcher collected the study participants only if they gave informed consent regardless of getting the sufficient sample size. But serum cortisol measurements were relatively counterchecked to those limitations.

Daily 1-hour meditation for 3 days, daily 30-minute aerobic physical exercise for 3 days and 30-minute group discussion for 1 day per week for 8-week duration might be applied to the upcoming nurse aid training program to manage stress and anxiety. Future research will be required for nursing students' population under training of the Nursing Universities and Nursing and Midwifery Schools.

CONCLUSION

The findings from this study indicated the mindfulness-based program had a positive effect on reduction of stress, anxiety level and serum cortisol level before and after 8-week intervention between intervention and control groups. This study might provide supportive evidence for a behavioral intervention to manage stress and anxiety among nurse aid students.

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