ORIGINAL ARTICLE

CAN DARK CHOCOLATE ALLEVIATE ANXIETY, DEPRESSIVE AND STRESS SYMPTOMS AMONG TRAINEE NURSES? A PARALLEL, OPEN-LABEL STUDY

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Abstract

Objective: **This interventional study was aimed to investigate the effects of dark chocolate consumption on anxiety, depression, and stress (ADS) among trainee nurses.** ***Methods:*** **A parallel and open-label experimental study was conducted. Of the 128 nurses enrolled, only 47 participated in the intervention study (mean age = 20.32 years; ranging from 19 to 22 years old). They were randomly assigned to an intervention group (IG, n = 25) or a control group (CG, n = 22). The IG consumed dark chocolate and CG ingested mineral water for 3 consecutive days. The validated Malay Hospital Anxiety and Depression Scale (HADS) and Depression, Anxiety and Stress Scale (DASS-21) were utilised for measuring ADS levels. Data were analysed descriptively and score comparisons were conducted using non-parametric tests.** ***Results:*** **No significant differences between IG and CG in ADS scores were detected at baseline (all $p > 0.05$). At post-consumption, ADS score were significantly reduced in IG (all $p < 0.01$) compared with CG (all $p < 0.05$). Larger effect sizes among these respondents had also revealed that there were mood-elevating effects of dark chocolate consumption.** ***Conclusion:*** **This study has discovered that 3-day consumption of dark chocolate may alleviate ADS status among trainee nurses suggesting that dark chocolate may have a more prominent role in improving emotional and mood generally. Further investigations are however warranted to confirm this finding.** ***ASEAN journal of Psychiatry, Vol.12(2), July - Dec 2011: XX XX.***

Keywords: anxiety, depression, stress, nurse, chocolate

Introduction

It is believed that the nursing profession is exposed to a greater extent of job-related psychological disorders compared to other healthcare professionals [1,2,3]. Similarly, nursing students experience relatively higher levels of physiological and psychological symptoms than students in other health-related disciplines of medicine, pharmacy and social work [4]. In the medical setting, stress coupled with anxiety and depression (ADS) among nurses is also not uncommon as they need to endure the burden of theoretical learning and to adapt to the unfamiliar experience of real clinical practice [5,6,7]. It was further found that anxiety and depression symptoms were more common in younger and less experienced student nurses [8]. Moreover, if ADS symptoms are not properly tackled and relieved, they tend to impose negative influences on the well-being of nursing students themselves and clinical performances and this ultimately would compromise patients' welfare [7,9]. Interventions designed to reduce ADS are crucial, as they may help students improve their clinical experience and also prevent burn-out in the long run [10].

Psychiatric medications such as anti-depressants or anxiolytic drugs are effective in treating ADS symptoms, but most may cause adverse effects and require a longer time to bring about the desired treatment effects [11,12]. In a review in 2004, it has been demonstrated that a substantial proportion of depressed patients preferred psychotherapy and were less likely to enrol in anti-depressant treatment [11]. The general perception towards psychotherapy was also very favourable among African women who regarded

medications as the last resort for treating depression [12]. In fact, these women believed that prayers, exercise, yoga, and meditation were the more reliable and effective depression treatments [12]. Lowe et al. (2006) also found that psychotherapy was the most frequently preferred treatment and the most common factor to improve emotional well-being for depressed patients, in contrast, anti-depressants were rarely mentioned as preferred treatment [13]. Similarly, anxiety patients had also reported favorable views on psychotherapy [14]. Moreover, non-psychotherapy measures such as prayer is also perceived to be more helpful in anxiety treatment among African American patients [15]. These types of attitudes and beliefs explain why some patients with anxiety and depression preferred alternative non-pharmacological treatments compared to psychiatric drugs. Furthermore, unlike psychiatric medications, patients undergo the non-pharmacological treatments only when necessary [16]. Treatment with anti-depressants are additionally subjected to problems non-adherence, which has recently been shown to be due to forgetfulness, improvement of condition, ineffectiveness of medication and even carelessness on part of patients themselves [16].

Nutritional wise, depressed and anxious individuals are advised to consume high carbohydrate food such as chocolate to enhance mood [17], because this practice may initiate the increase of serotonin production which resulted in mood alleviation [17,18]. However, limited studies have focused on food therapy in treating ADS disorders. Many people crave for chocolate for its pleasure and positive emotions [17], as chocolate is also claimed to be a unique mood-enhancing food [17,19], During the last decade, increasing interest in the relationship between stress and chocolate has led to some exploratory studies in human [19,20]. These findings could further contribute to the understanding of the association between chocolate-eating and emotional disorders. In particular, the consumption of chocolate was also found to relieve stress [21]. In seasonal affective disorder (SAD), chocolate-eating is a form of self medication which has a positive impact on the brain neurotransmitters and has shown benefits as antidepressant [18]. Dark chocolate is believed to bring tangible benefits for health since the ancient time, its consumption could affect the metabolism of people who experience high level of stress [20]. Daily dark chocolate consumption for 2 weeks has also been found to exert positive impact on stress-associated metabolic disorders among stressed individuals. In the current study, dark chocolate was utilized as the intervention food because of its palatability and it higher caloric content, which may be the contributors that improve ADS levels [21,22]. Moreover, the distinctive aroma, the higher caloric contents and psycho-pharmacologic constituents are potential contributors in promoting better mood states [21,22,23]. Few studies, however had evaluated dark chocolate consumptions on ADS and mood levels among trainee nurses. In this exploratory study, we initially screened for ADS symptoms among the nurses and later tested the hypotheses whether eating a piece of 50g dark chocolate daily for three consecutive days could induce significant changes in the ADS symptom scores. Specifically, we aimed to compare ADS scores at pre-consumption and post-consumption.

Methods

Research Design and Sample Selection

The exploratory study was parallel, prospective, randomized and open-labelled. The research participants were students enrolled in their third year of diploma in nursing course at the Faculty of Medicine and Health Sciences, Universiti Sultan Zainal Abidin (UniSZA), Hospital Sultanah Nur Zahirah (HSNZ), Kuala Terengganu and Kuantan Specialist Hospital. The selection criteria for this study were: age 18 years or older, Malay-literate, no current or previous experiences with psychotherapy, not allergic to chocolate, no medical conditions, no complication in swallowing and chewing, and recorded Hospital Anxiety and Depression Scale (HADS) domain scores $\geq$ 8 (considered as possible case) [24,25]. All participants gave informed consent prior to their inclusion in this study. For possible mild cases of anxiety and depression students were adviced to consult their Head of Programme for further actions. As definite diagnoses can only be

made by qualified professionals, this was the only way we could ensure that their emotional problems were ethically kept in check.

At least 3 days before of the study begun, all the participants were instructed to prohibit from taking chocolate products such as dark chocolate and brown chocolate during the study period. The volunteers were also asked to abstain from food intake at least 4 hours before receiving the intervention. A 3-day chocolate consumption period was intended to avoid the test food from becoming insensitive among the participants (desensitization effect) [26]. Mineral water was the choice for the control because it contains no cocoa derivatives and sugar which could potentially confound our outcomes. Moreover, the main intention was to mimic a "placebo" (i.e.nothing) as close as possible and mineral water had also been used in previous study [17]. All participants were ensured of their confidentiality and fully comprehended that the information gathered were only to be used for research purposes.

For this study which involved two groups, a power of 0.80 and α error at 0.05 for significance was used to estimate the number of respondents per group [27, 28].

Instruments

Personal particulars

Socio-demographic information was collected through the Personal Particulars form which was distributed to the selected students. This form consisted of 10 questions which included: gender, age, marital status, race, religion, education level, liking/loving and craving for chocolate, the extent of loving chocolate and the amount of chocolate consumption per week. The respondents were asked on whether they "like chocolate/crave for chocolate" or "dislike chocolate/do not crave for chocolate" through two close-ended questions. They were also required to rate the extent of liking chocolate through responses categorised from 0 to 10 with anchor ends [17].Scores for this question ranged from 0 (do not love chocolate at all) to 10 (extremely loved chocolate).Chocolate-loving and craving were assessed because both aspects have been shown to be closely associated with chocolate consumption habit which could affect the final outcomes [17,23].

The validated Malay Hospital Anxiety and Depression Scales (HADS).

The HADS [25] has been extensively used to screen for anxiety and depression levels in clinical and non-clinical populations [29,30]. This instrument is a self-assessment tool that consists of a seven-item anxiety subscale (HADS-A) and a seven-item depression subscale (HADS-D). The validated Malay version of HADS was the instrument employed in this study [25,31,32]. This 14-item scale provided information about the trainee nurses' anxiety and depression status for the "past two days". The responses on each scale were obtained on a four point Likert scales from 0 (not present) to 3 (considerable). Scores for each subscale of this instrument ranged from 0 (no symptom) to 21 (high level of symptom). A subscale total score $\geq$ 8 was set for inclusion criteria and considered as possible case. Grading from 0 to 7 was categorized as "non-case", 8 to 11 as "mild symptom", 12 to 14 as "moderate symptom" and 15 and above as "severe symptom".

The validated Malay Depression Anxiety and Stress Scale (DASS-21).

The DASS-21 [33] is the shorter form of the original DASS-42 questionnaire which measures negative emotional states of depression, anxiety and stress [34]**.** The Malay DASS-21 is a translated version which possessed evidence for favourable psychometric properties for the Malaysian general population [34]. This instrument contains three sections of 7-item self- report scales for measuring anxiety (DASS-A), depression (DASS-D) and stress (DASS-S). Each subscale was scored on a 4-point scale from 0 (not present) to 3 (considerable). This scale measures the extent to which each state has been experienced "over the past 2 days". Scores for the ADS scales were determined by summing the raw scores for the relevant 7 items; the scores for each subscale were then multiplied by two because DASS-21 is the truncated version of DASS-42, this multiplication procedure was performed to ensure comparability of outcomes to DASS-42 in accordance to the manual [35]. The sum of

scores for each subscale after multiplication ranged from 0 (no symptoms) to 42 (high level of symptoms). This instrument was additionally used to support and substantiate the results from HADS. Moreover, it provides evidence of convergent validity against HADS.

Study Procedures

This study was approved by the Ministry of Health Malaysia (reference number: KKM/NIHSEC/08). All of the information on this study will be strictly confidential. Participants are allowed to withdraw from the study at any time. The study began with a short briefing; participants were provided with a research information sheet. After the preliminary investigation, the participants were randomly assigned to an Intervention Group (IG, n = 25) or a Control Group (CG, n = 22) (See Figure 1).

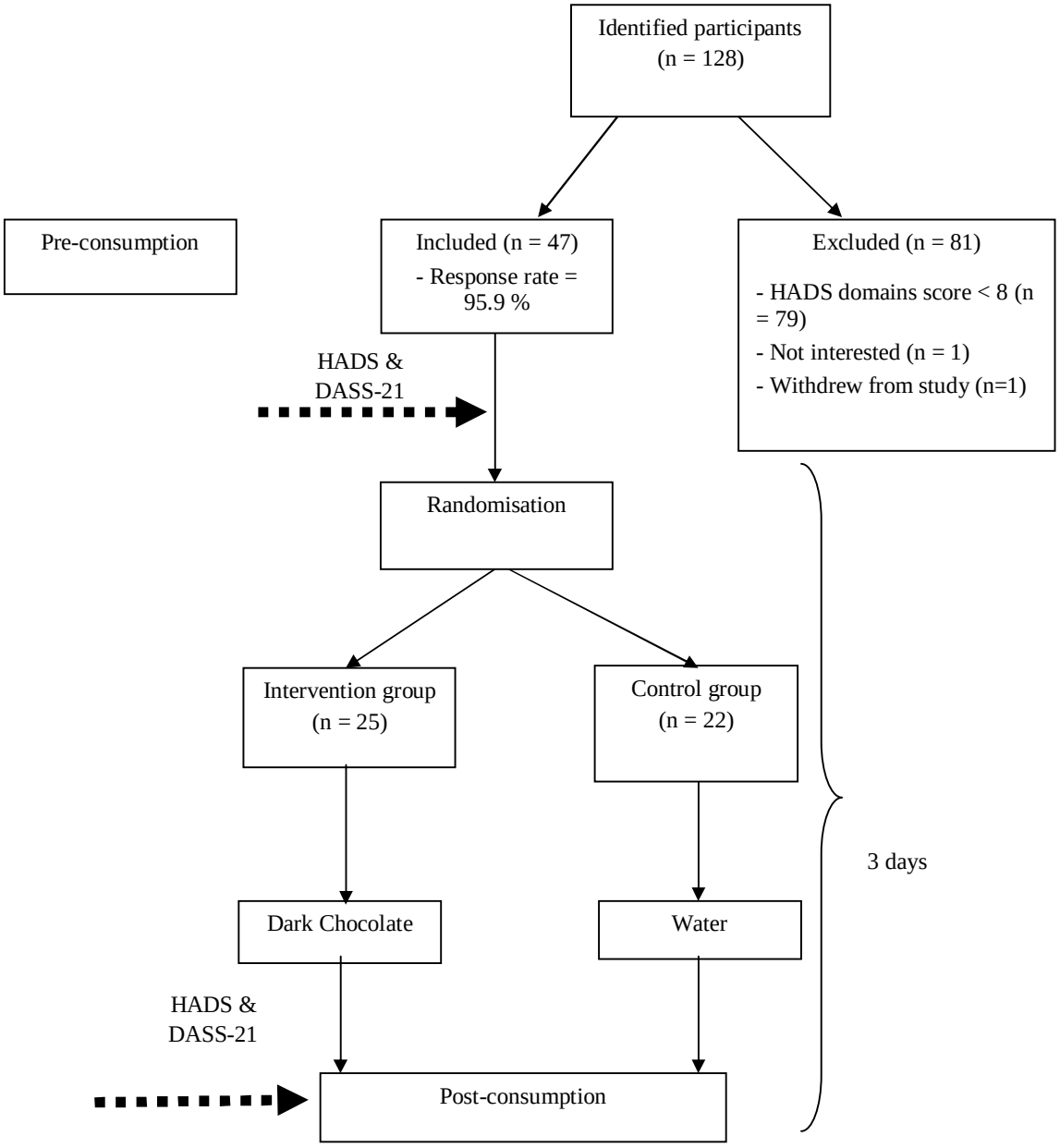

Figure 1: Experimental study design.

For the randomization procedure, each nurse drew a number from a box which contained numbers 1 to 50. Odd numbers were assigned to IG while even numbers were placed in CG. At pre-consumption and two to three hours post-consumption, the participants completed the Personal Particulars form, DASS-21 and the HADS instruments. After the preliminary investigation, the trainee nurses were randomly assigned to an intervention group (IG, n = 25) or a control group (CG, n = 22). The interventions were administered to the volunteers daily from pre-consumption (Day 1) to post-consumption (Day 3). The IG consumed dark chocolate Vochelle @TM (50g, 275kcal) and CG ingested mineral water daily for 3 consecutive days. The dark chocolate/mineral water was administered to the volunteers between 11 a.m. and 1 p.m. or between 5 p.m. and 7 p.m. daily. Once the respondents completed the entire procedure they were presented with a token of appreciation.

Data analysis

For statistical analysis, SPSS 17.0 for Windows was used. Socio-demographic data was analyzed descriptively and presented as frequencies and percentages. Normality test was performed and Kolmogorov-Smirnov statistics was both significant indicating that normal distribution was not assured. Consequently, subsequent score comparisons were conducted using Mann-Whitney U (between group) and Wilcoxon Sign Rank tests (within group). Values of $p < 0.05$ were considered statistically significant. Effect sizes using Cohen's (1988) interpretation were also calculated between the two time points [36].

Results

Participants

Of the 128 nurses identified, 47 (response rate = 37%) met inclusion criteria and participated in the intervention study. The results of verification of homogeneity for socio-demographic characteristics are displayed in Table 1. All participants in this study were female, not married, and had completed SPM education. The average age for both IG and CG were 20.32 years (ranging from 19 to 22 years old). More than 90% of the participants claimed that they liked chocolate. The extent of loving-chocolate was found to be 79%. The mean amount of chocolate consumption in a week was 2.30 x 50g bars for IG and 2.13 x 50g bars for CG. A large percentage of the respondents were chocolate-lovers (> 92%) and more than half of both IG and CG respondents did not possess the tendency for chocolate craving. No significant difference was reported for stress experience and craving for chocolate for both IG and CG.

Pre-Consumption vs. Post- Consumption

Pre-consumption ADS levels as measured with HADS and DASS-21 are shown in Table 2. No significant difference was observed in domain scores for IG and CG at pre-consumption (all $p > 0.05$), indicating that the two groups were comparable in terms of the variables intended for assessment. Significant declines in ADS were demonstrated in IG participants between pre-consumption and post-consumption ($p < 0.001$) for DASS-21 domains (Table 3). Between IG and CG, there were also significant reduction of HADS-A and HADS-D scores at day 3 post-consumption. However, greater effect sizes were exhibited by IG compared to CG. Differences for ADS between groups (IG and CG) are displayed in Table 4 (all $p < 0.01$).

Table 1: Socio-demographic characteristics at pre-consumption for IG (n = 27) and CG (n = 22)

Characteristics		**Intervention group n (%)**	**Control group n (%)**	***P* value***
Stress	Yes	22 (88)	18 (81)	0.553
	No	3 (12)	4 (18)	
Crave for chocolate?	Yes	15 (60)	11 (50)	0.491
	No	10 (40)	11 (50)	
Like chocolate?	Yes	23 (92)	22 (100)	-
	No	2 (8)	0 (0)	
Marital status	Yes	0 (0)	2 (9)	-
	No	25 (100)	20 (91)	
Gender	Female	25 (100)	22 (100)	-
	Male	0 (0)	0 (0)	
Mean age (years)		20.32	20.32	0.959
Loving-chocolate (Mean ± SD)		7.60 ± 2.54	8.81 ± 1.78	0.180
Chocolate consumption per week (Mean ± SD)		2.30 ± 1.57	2.13 ± 1.03	0.826

*X^2 tests for independence; $p < 0.05$ = significant.

Table 2. Subscales scores for intervention group (IG) and control group (CG) at pre-consumption.

Subscales	**IG (n =25)**		**CG (n = 22)**		***p* value***
	Median (range)	Mean (±SD)	Median (range)	Mean (±SD)	
HADS-A	9.00 (8-14)	9.12 (1.42)	10.0 (8-13)	9.45 (1.37)	0.303
HADS-D	9.00 (8-13)	9.16 (1.42)	9.00 (8-13)	9.50 (1.50)	0.344
DASS-A	14.00(10-32)	17.28 (6.47)	14.00 (10-22)	15.27 (3.73)	0.476
DASS-D	16.00(10-28)	16.24 (5.23)	16.00 (10-22)	16.00 (3.26)	0.855
DASS-S	16.00(10-28)	17.04 (5.48)	16.00 (12-26)	16.54 (3.71)	0.966

*Mann-Whitney U test; $p < 0.05$ = significant; HADS = Hospital Anxiety and Depression Scale; DASS = Depression Anxiety and Stress Scale; A = Anxiety; D = Depression; S = Stress.

Table 3: Within group comparisons of anxiety, depression, and stress (ADS) (IG vs. CG)

Subscale		**Pre**		**Post**		***p* value***	**Z**	**Effect size**
		Median (Mean rank)	Mean (± SD)	Median (Mean rank)	Mean (± SD)			
HADS-A	IG	9.00 (0.00)	9.12 (1.42)	5.00 (12.50)	5.16 (2.13)	< 0.001	-4.307	0.86
	CG	10.00 (2.50)	9.45 (1.37)	7.00 (9.41)	7.59 (2.30)	< 0.001	-3.538	0.75
HADS-D	IG	9.00 (0.00)	9.12 (1.36)	5.00 (12.50)	5.40 (2.42)	< 0.001	-4.309	0.86
	CG	9.00 (0.00)	9.50 (1.50)	7.50 (10.50)	7.32 (1.67)	< 0.001	-3.955	0.84
DASS-A	IG	14.00 (2.50)	17.28 (6.48)	10.00 (12.43)	10.48 (4.01)	< 0.001	-4.132	0.82
	CG	14.00 (13.33)	15.27 (3.73)	16.00 (8.18)	15.82 (3.08)	0.570	- 0.568	0.12
DASS-D	IG	16.00 (7.50)	16.24 (5.23)	10.00 (13.23)	10.56 (4.10)	< 0.001	-4.200	0.84
	CG	16.00 (9.77)	16.00 (3.27)	16.00 (11.39)	16.18 (4.82)	0.925	- 0.094	0.02
DASS-S	IG	16.00 (0.00)	17.04 (5.48)	10.00 (12.50)	10.08 (5.11)	< 0.001	-4.300	0.86
	CG	16.00 (7.33)	16.54 (3.71)	15.00 (10.58)	14.90 (3.89)	0.067	-1.831	0.39

Pre = pre-consumption; Post = post-consumption; *Wilcoxon Signed Rank test; $p < 0.05$ = significant; Effect size: small = 0.2 – 0.49, medium = 0.5 – 0.79, large effect = ≥ 0.8.

Table 4: Between group comparison of anxiety, depression, and stress (ADS) (IG vs. CG).

	Subscales		Median	Minimum – maximum	Mean rank	Z	*p* value*
HADS-A	Pre	IG	9.00	8 – 14	22.16	-1.030	0.303
		CG	10.00	8 -13	26.09		
	Post	IG	5.00	1 – 10	17.92	-3.275	0.001
		CG	7.00	8 – 13	30.91		
HADS-D	Pre	IG	9.00	1 – 10	22.30	- 0.947	0.344
		CG	9.00	5 – 11	25.93		
	Post	IG	5.00	1 – 10	18.26	-3.095	0.002
		CG	7.50	5 – 11	30.52		
DASS-A	Pre	IG	14.00	10 – 32	25.32	- 0.713	0.476
		CG	14.00	10 – 22	22.50		
	Post	IG	10.00	0 – 20	16.20	-4.226	< 0.001
		CG	16.00	10 – 20	32.86		
DASS-D	Pre	IG	16.00	10 – 28	23.66	- 0.183	0.855
		CG	16.00	10 – 22	24.39		
	Post	IG	10.00	5 – 22	17.02	-3.751	< 0.001
		CG	16.00	6 – 24	31.93		
DASS-S	Pre	IG	16.00	10 – 28	24.08	-0.043	0.966
		CG	16.00	12 – 26	23.91		
	Post	IG	10.00	2 – 22	17.64	-3.415	0.001
		CG	15.00	8 – 26	31.23		

* Mann-Whitney U test; $p < 0.05$ = significant; Pre = pre-consumption; Post = post-consumption.

Discussion

It has been well-known that chocolate possesses the ability to improve mood [17,23,35], This experimental study was designed to determine whether dark chocolate consumption could suppress ADS levels. Overall participants were comparable in terms of gender, age, marital status, education levels and chocolate-loving trait. Furthermore, the domain scores for HADS and DASS were not significantly different at pre-consumption. A 3-day dark chocolate consumption seemed to decrease ADS levels among the trainee nurses. In our study, the higher score differences and larger effect sizes in the IG also revealed that the ADS-alleviating effects of dark chocolate did not merely occur by chance for chocolate-loving participants. The results of this study support some of the former studies on chocolate consumption [17,18,19,20,21].

The physiological indicators of mood disorder especially ADS symptoms have been shown to be related [37]. Any intervention that produces effect on stress is expected to create

the same outcome on anxiety [37]. The findings in our pilot study also paralleled with this outcome. Similarly, intervention that can lower blood pressure, pulse rate, and respiratory rate could also promote in the improvement of anxiety [38]. Dark chocolate possessed similar advantages by creating a declining effect on blood pressure (one of the physiological indicators of anxiety) probably due to the high flavonoid level [39].

Studies in the past have also demonstrated that chocolate consumption improved negative induced mood state immediately, depending on palatability [17]. Higher percentages of cocoa are found in dark chocolate which produced relatively bitter taste during ingestion. However, manufacturers commonly add extra sweetness in dark chocolate as to improve its palatability. The distinctive aroma, high carbohydrate contents (275 kcal) and psycho-pharmacologic constituents were perceived to be the possible contributors to oro-sensory effects which resulted in lowering of ADS levels [17,40,41,42]. Nutrient-dependent changes during dark chocolate intake have also been proposed to mediate mood alleviation by producing a larger amount of serotonin acting on 5HT receptor [43].

Chocolate possess many beneficial health effects include cardioprotective effect, anti-cancer, chemopreventive effect on chronic disease, cough preventor, anti-diarrhoea and brain stimulator [23]. However, the psychoactive agents and the high caloric contents are considered as one of the down side in chocolate consumption as they may cause weight/blood glucose increments, craving and even addiction [23,44]. In addition, it is clear that chocolate may also cause neurologic effects because it can induce migraine in certain individuals due to its caffeine and theobromine contents [45]. Therefore, chocolate consumption should be prohibited among individuals who are allergic to caffeine and theobromine. Unconstrained consumption in large quantities is also thought to increase the risk of obesity without a corresponding increase in activity. Alternatively, the semi-sweet or bitter sweet dark chocolate which contains lower calories is recommended to prevent weight gain in susceptible individuals.

Despite the recognition of this matter however, not many studies have been widely conducted to determine the effects of dark chocolate consumption on ADS symptoms among nurses. The findings in our study could not compare with any data from local studies, as to our knowledge there was no other chocolate studies had been conducted among student nurses. The outcome of this pilot study has a potentially far-reaching benefit than only to the respondents of this sample alone.

There were possible response biases due to prior perception that dark chocolate consumption may alleviate ADS levels. Perhaps liking chocolate or not will influence the outcomes on ADS. Nonetheless, we did not distinguish the chocolate-loving respondents from non- chocolate-loving respondents. An open-label study is a type of clinical trial in which both the researchers and participants know which treatment is being administered [46]. An open-label trial may be unavoidable under some circumstances, such as in our study where placebo is not available. We also attempted to minimize this limitation inherent in an open-label design by having similar packaging for both interventions. Additionally, randomisation was also incorporated in our study to reduce bias in group allocation. We did not and could not possibly control the overall food intake of each participant during the study period which may have also confounded the findings. Because these findings are limited to the younger age and female group, we acknowledge that the results may not be generalizable to other sample of respondents with differing demography. At this point, we could say that dark chocolate may be useful as an alternative non-pharmacological treatment to improve mood. However, further investigations are warranted before we can use dark chocolate as a practical food remedy in psychiatric therapy. In future, studies on dark chocolate intervention with a longer study period, along with diagnostic interviews and biophysiological factors examinations are highly recommended. Most importantly, perhaps the presentation or packaging and outlook of the intervention and control should be more uniformed and indistinguishable. For example, placebo (with no cocoa derivative) or dark chocolate in pill form shall be used for the control.

Conclusions

ADS status was significantly improved in the group of nursing students who consumed dark chocolate compared to those who did not, suggesting that 3-day dark chocolate consumption seemed to be effective in reduction of ADS symptoms. However, further studies with greater methodological rigor are necessary in order to confirm these findings. Therefore, this exploration study served as a basis for future research on dark chocolate consumption as a non-pharmacological relief method for mild cases of mood disorders among nurse respondents pursuing their internship training.

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