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RESEARCH ARTICLE

The effect of online nutrition and lifestyle education on body image dissatisfaction, body mass index, and disordered eating among female university undergraduate students in Lagos, Nigeria

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Background: Despite the increasing prevalence of body image dissatisfaction (BID), the effect of social media on body image (BI) among undergraduates, and the prohibitive cost of traditional health education interventions, little is known about the effectiveness of online lifestyle interventions to address BI, body mass index (BMI) and disordered eating (DE).
Objectives: This study aimed to assess the effect of an online nutrition and lifestyle intervention programme on BI, BMI, and DE among female undergraduate students in Lagos.
Methods: A quasi-experimental study involving intervention and control groups was undertaken. A total of 1 182 students (590 students from intervention and 592 from control) responded to follow-up out of 2 015 who completed the pre-intervention survey. Data were collected using pre-tested semi-structured self-administered questionnaires. Pulver's Figure Rating Scale was used to determine BID. BMI was calculated following standard procedures. DE was assessed using the Eating Attitudes Test (EAT-26). The intervention programme was implemented through online learning and social media for 12 weeks. SPSS (version 25) was used for analysis. The association between variables was determined using chi-square while the level of significance was set at $p = < 0.05$.
Results: The intervention reduced BID, BMI and DE among the intervention group significantly ($p < 0.05$) compared with the control group. Although the highest proportion of students with BID was among the overweight/obese, many students who were normal weight (49.2%) or underweight (47.3%) were dissatisfied.
Conclusion: Online nutrition and lifestyle education could effectively reduce BI, BMI and DE among female undergraduate students in Lagos, Nigeria.

Keywords body image dissatisfaction, online health education interventions, online lifestyle interventions, body mass index, disordered eating

Introduction

The emphasis on physical appearance by the media constantly portraying thinness as synonymous with beauty can result in a significant discrepancy between bodyweight dissatisfaction and actual body mass index (BMI).[1]

Before the twentieth century, thinness was associated with illness, but since then it has become an indicator of good health, while overweight/obesity has been associated with diseases and unattractiveness.[2] Obesity is now associated with body image dissatisfaction and disordered eating.[3,4]

Disordered eating refers to a range of irregular eating behaviours that may not meet the specific diagnostic criteria for recognised eating disorders (such as anorexia nervosa or bulimia nervosa), but can still have significant effects on physical, mental or emotional health. [5]

Paradoxically, as developing countries become more westernised, an increase in the consumption of unhealthy foods and a decrease in physical activity have increased the prevalence of overweight and obesity.[6,7]

Body image dissatisfaction is a major contributor to unnecessary dieting, which can result in disordered eating, which may result in eating disorders.[8] Over the past 30 years, body image issues and disordered eating have increased globally among young adults, especially females in higher institutions of study.[9,10] Globally, the estimated number of adults with eating disorders is increasing, with an estimated 24 million Americans and 70 million individuals affected worldwide.[1,8]

Because the behavioural risk factors (such as unhealthy diet, alcohol consumption and sedentary lifestyle) contributing to the development of obesity, body image dissatisfaction and eating disorders are initiated early in life, preventive activities should start at an early age. Transitioning from adolescence to adulthood is important for establishing behavioural patterns affecting long-term health and chronic disease risk.[11]

Higher education is a transition period usually accompanied by adverse changes in health behaviours. It has been implicated as a stage of the lifecycle with increased risk for weight gain.[12] Moreover, university students have been identified as one of the populations usually concerned about their body image who experience body image dissatisfaction.[13,14] As a result, this period is an important time in the lifespan to initiate interventions.[15] Moreover, a paucity of published studies have investigated body image dissatisfaction in developing nations, including Nigeria.[1,16]

A study conducted among undergraduates at Michael Okpara University in Abia State, Nigeria, reported high body shape dissatisfaction, especially among females (62%).[17] Research among Benin public and private school learners reported that 82.9% of those surveyed were dissatisfied with their body image.[1] None of the studies conducted among undergraduate university students in Nigeria was exclusively on female samples. Moreover, despite the increasing trend in body image dissatisfaction globally, the effect of social media on this phenomenon and the high connectivity of university students to digital technologies, little is known about the effectiveness of online nutrition and lifestyle interventions delivered through social media to address BMI, body image perception and disordered eating.[18,19]

Interventions of this nature are usually conducted through face-to-face traditional delivery methods.[20] However, running such conventional face-to-face interventions has inherent costs, time, place and other limitations.[21] Technology represents an attractive medium for delivering health interventions among college students, given its reach, appeal and flexibility in teaching and learning; online programmes have been shown to help people achieve and maintain weight loss.[22] It is, therefore, useful to explore the feasibility of an online approach in overcoming the limitations above and maximising the opportunities.[21] Undergraduate students are thus an ideal target group for online nutrition and health education strategies.[23]

This study was conducted to determine the effect of an online nutrition and lifestyle intervention involving social media techniques on body image dissatisfaction (BID), body mass index (BMI) and disordered eating among female undergraduate students in Lagos, Nigeria.

Methods

The research was conducted in the universities in Lagos State, Nigeria. All female full-time undergraduate students in the universities who were healthy and owned a smartphone or laptop were eligible to participate in the study. The transtheoretical model/stages of change, social support theory, learning theories for online education and online collaborative learning (OCL) were employed in designing this research, as evidence indicates that the use of relevant theories in the design of health behaviour interventions increases their efficacy in behaviour change.[24]

Transtheoretical model/stages of change

In this current research, behaviours that need intervention include inadequate water intake, unhealthy diet, negative body image, disordered eating, low level of physical activities, stressful lifestyle, sitting too much, inadequate sleep and negative weight management techniques.

Different BEHAVIOUR CHANGE TECHNIQUES were combined to conduct this intervention. Goal setting, changing behaviour, functional thinking and positive talk, visualisation and self-monitoring were combined as weight management tools.[25,26]

Social support theory

Undergraduate students were recruited and gathered as a community on a WhatsApp group where they interacted, made comments and learnt at their own pace as reinforcement delivered through social networks. Zoom meetings were held to create a similar setting to face-to-face interaction. The students were also referred to a website created for the research (www.FoluOlatona.com), where they could interact with lessons and ideas on body image satisfaction and weight management strategies.[27]

Major learning theories, such as cognitivism, connectivism and heutagogy, are relevant to online learning and were employed in this research.[28,29]

The minimum sample size was calculated using the formula to compare the proportions of two independent groups. The minimum sample size calculated was 556 for each group (after compensating for non-responses and attrition). However, a higher sample of 1 009 students from the intervention and 1 005 from the control group were recruited into the study and completed pre-intervention questionnaire based on the peculiarity of higher attrition rates in online intervention. A total of 590 participants from the University of Lagos (UNILAG), the intervention group, and 592 participants from Lagos State University (LASU), the control group, completed the questionnaire for the post-intervention survey.

Sampling

A multi-stage sampling technique was employed to select the participants. Two out of three campuses were selected for the study. UNILAG was selected (using the balloting method) as the intervention group, while LASU was regarded as the control group. Simple random sampling (balloting) was used to select four faculties from each university in the first stage; two departments were selected from each faculty to give eight departments from each university in the second stage. Stratified random sampling was used to select two cohorts of students from each of the eight departments to give sixteen cohorts from each university as the third stage. Balloting was used to select one class from each cohort to give sixteen classes from each university, hence a total of thirty-two classes from both universities as stage four. Systematic random sampling was used to select the respondents from each class using the class list as the sampling frame. Two thousand and fourteen students were selected from both universities for stage five.

Setting

Data were collected from students in their various classes.

Data collection

Data were collected using a pretested semi-structured self-administered questionnaire before and after intervention. Questionnaires on sociodemographic and economic status were adapted from past literature.[30] Anthropometric measurements (weight and height) were collected following standard procedures[31,32] and body image dissatisfaction was assessed using Pulver's Figure Rating Scale Silhouette.[30] Disordered eating was assessed using the Eating Attitudes Test (EAT-26).[33]

The questionnaire was pre-tested in a public university close to Lagos, and some adjustments were made to it before the commencement of the main study. Ten field assistants (nutritionists and medical students) were trained (by the researcher) to conduct anthropometric measurements and data entry. Most questions, except section D, were mandatory for the students and research assistants to complete before submitting, to avoid improperly completed questionnaires. The completed questionnaire was entered into Google Forms before analysis to eliminate errors.

Based on the baseline screening variables, a 12-week health education intervention using online learning techniques (including social media) was developed to address the screening outcomes.

Intervention implementation

The programme was implemented through online nutrition and lifestyle learning consisting of Zoom meetings and social media (WhatsApp, private Facebook group, Instagram, email, and website) posts for 12 weeks to improve the participants' body mass index, body image dissatisfaction and reduce disordered eating. The specific contents of the nutrition and lifestyle intervention programme are as follows: Week 1: Setting a reasonable weight goal; Week 2: Factors that influence bodyweight; Week 3: Healthy ways of managing bodyweight; Week 4: The importance of dietary diversity and healthy eating tips; Week 5: Demonstration of healthy cooking methods; Week 6: Fast foods, take away and dining out; Week 7: Interpreting food labels; Week 8: Increasing physical activity without going to a gym; Week 9: Incorrect perceptions regarding weight control; Week 10: Body image and associated factors; Week 11: Disordered eating; Week 12: Summary of lessons learnt and presentations of feedback by participants.

Emails were sent to participants in the online group to inform them of the webinars on Zoom ahead of the Zoom meeting and remind them of lessons learnt after the meeting. The lesson notes and videos from webinars were posted immediately after each webinar on the researcher's website (URL: www.foluolatona.com), created for the research in a beautiful format to encourage reading and viewing. Study counsellors posted two different types of designed messages to each WhatsApp group, Facebook group and Instagram page every day for 12 weeks.

At the end of the 12 sessions of the intervention programme, a summary book was written and disseminated to all the participants in the intervention group on WhatsApp. Noting that some participants may prefer to avoid engaging with a social network, a variety of options for information delivery and social support were provided for the intervention group. No webinar, notes, posts or email were sent to the participants in the control group. The post-intervention measurements were taken six months after completing the pre-intervention survey.

Data analysis

The IBM Statistical Package for the Social Sciences (SPSS version 25; IBM Corp, Armonk, NY, USA) was used to validate and analyse quantitative variables. Appropriate statistical tests of significance between the two groups were used to compare them. Sociodemographic data were analysed using descriptive statistics. Frequency distribution was generated for variables. Chi-square and Fisher's exact tests were used to compare differences between characteristics of respondents before and after intervention and other proportions, while the t-test was used to compare differences between means. A p-value ≤ 0.05 was considered statistically significant. Analysed data were presented as frequency tables, cross-tabulations and charts.

Body mass index was analysed following standard procedure by the World Health Organization (BMI = weight (kg)/height (m^2)). Body image dissatisfaction was analysed using the 'feel-ideal difference' index score based on Pulver's figure rating scale. The ideal body image score was deducted from the perceived image figure to find the feel-ideal difference: body dissatisfaction. Values other than zero represent body image dissatisfaction. A positive value indicates the participant's wish to be thinner than the perceived current size. In contrast, a negative value reflects the participant's wish to be heavier than the current perceived size.

The scores of EAT 26 were analysed to determine disordered eating attitudes. Scores greater than 20 indicate a disordered eating attitude, hence a need for further investigation by a qualified professional. However, low scores (below 20) can still be consistent with serious eating problems, as denial of symptoms can be a problem with eating disorders. The analysis was done on the data collected before and after the intervention.

Ethical considerations

Ethics approval was sought and obtained from the Health Research and Ethics Committees of the Lagos State Teaching Hospital (Approval No: LREC 06/10/1324) and UKZN Biomedical Research Ethics Committee (Approval No: BREC/00000949/2020) before the commencement of the study. Permission to conduct the study was obtained from both universities' deans of student affairs. Informed written consent to participate was obtained from the students. Confidentiality and anonymity were assured and maintained throughout the study. The e-book on Weight Management and Healthy Lifestyle was distributed to the control group so that they would not be denied the benefits of the research.

Results

Sociodemographic and economic characteristics of the students in the two populations

The two student populations were similar pre-intervention except for religion, tribe and residence. There were more Christians and Yorubas in UNILAG compared with LASU, which has more Muslims and Igbos. Most of the UNILAG students live on campus, while most LASU students live outside the campus. Pre-intervention characteristics were also similar for those who dropped out of the study versus those who completed the study, for the intervention and control groups.

Body mass index of intervention and control group pre- and post-intervention

There was a significant difference between the nutritional status of respondents in UNILAG before and after intervention ($p < 0.005$). The proportion of undergraduates who had normal weight increased while those who were overweight reduced. The mean BMI was also statistically significantly lower after the intervention, indicating that the students were inclined towards losing excess weight ($p < 0.001$) (Table 1).

Body image dissatisfaction of intervention and control groups pre- and post-intervention

Post-intervention, the prevalence of body image dissatisfaction (BID) was significantly lower among UNILAG students than LASU students ($p < 0.001$). This result implies that the intervention effectively addressed BID among female university undergraduates (Table 2).

Prevalence of disordered eating behaviour among intervention and control groups pre- and post-intervention

Post-intervention, the prevalence of disordered eating was higher in both universities. However, the difference was significant only among the control group ($p < 0.001$), indicating a worse scenario of disordered eating attitudes. The difference between the prevalence of disordered eating among the two populations post-intervention was statistically significant ($p < 0.001$), indicating that the intervention effectively addressed disordered eating (Figure 1).

Table 1: Nutritional status of all participants in the intervention and control groups before and after intervention.

Intervention group				
BMI (kg/m^2)	**Pre-intervention (n = 1 009)**	**Post-intervention (n = 590)**	**χ^2**	***p*-value**
	Frequency (%)	**Frequency (%)**		
Underweight (< 18.5)	135 (13.5)	110 (18.6)		
Normal weight (18.5–24.9)	619 (61.0)	374 (63.4)	16.88	0.005
Overweight/Pre-obesity (25.0–29.9)	183 (18.3)	72 (12.2)		
Obese Class I (30.0–40.0)	80 (8.0)	34 (5.8)		
Mean BMI ± SD	22.8 ± 4.4	22.0 ± 4.8	T = 3.3913	< 0.001
Control group				
BMI (kg/m^2)	**Pre-intervention (n = 1 005)**	**Post-intervention (n= 592)**	**χ^2**	***p*-value**
	Freq (%)	Freq (%)		
Underweight (< 18.5)	133 (13.3)	127 (21.5)	23.19	< 0.001
Normal weight (18.5–24.9)	597 (59.3)	338 (57.1)		
Overweight/Pre-obesity (25.0–29.9)	195 (19.5)	81 (13.7)		
Obese (30.0–40.0)	80 (8.0)	46 (7.8)		
Mean BMI ± SD	23.1 ± 4.6	22.0 ± 5.2	T = 4.395	< 0.001

*Row percentage, otherwise, column percentage; ***p-value obtained by McNemar test.

Table 2: Body image dissatisfaction among both populations pre- and post-intervention.

Variable	**Pre-intervention Freq (%) (n = 1 009)**	**Post-intervention Freq (%) (n = 590)**	**χ^2**	***p*-value**
Intervention group:				
Body image dissatisfaction				
Dissatisfaction	575 (57.0)	316 (53.6)	1.773	0.183
Satisfaction	434 (43.0)	274 (46.4)		
Body image desired				
Thinner	285 (28.2)	181 (30.7)	9.370	0.009
Heavier	290 (28.7)	135 (22.9)		
Satisfied	434 (43.0)	274 (46.4)		
Control group:				
Body image dissatisfaction				
Dissatisfaction	609 (60.6)	376 (63.5)	1.341	0.247
Satisfaction	396 (39.4)	216 (36.5)		
Body image desired				
Thinner	320 (31.8)	188 (31.8)	1.951	0.377
Heavier	289 (28.8)	188 (31.8)		
Satisfied	396 (39.4)	216 (36.5)		
Both groups post-intervention:				
	Intervention	Control group		
Body image dissatisfaction				
Dissatisfaction	316 (53.6)	376 (63.5)	12.064	0.001
Satisfaction	274 (46.4)	216 (36.5)		
Body image desired				
Thinner	181 (30.7)	188 (31.8)	15.691	0.001
Heavier	135 (22.9)	188 (31.8)		
Satisfied	274 (46.4)	216 (36.5)		

Association between body mass index and body image dissatisfaction

BID was highest among the overweight and obese students and the association between BMI and BID was statistically significant in both populations ($p < 0.001$ and $p = 0.003$). However, there was no significant association between BMI and disordered eating behaviour (Table 3).

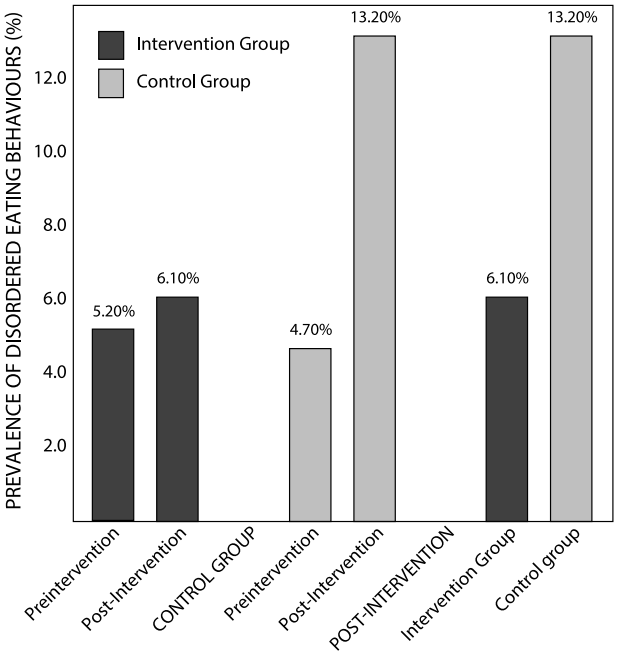

Figure 1: Prevalence of disordered eating attitudes among undergraduates in Lagos State among the intervention and control groups pre- and post-intervention. ($p < 0.001$).

Association between body mass index and disordered eating behaviour

The highest prevalence of disordered eating attitude was among the underweight followed by obese students, but the difference was not statistically significant.

There was no association between body image satisfaction and disordered eating attitude post-intervention (Table 3).

Discussion

There was a significant difference between the nutritional status of respondents in UNILAG before and after the intervention. Those who had normal weight increased while those who were overweight reduced. The mean BMI was also statistically significantly less after the intervention, indicating that the students tend to lose excess weight. Many previous studies have reported little or no significant change in respondents' body mass index in multicomponent interventional studies.[34,35] However, these findings are consistent with the results obtained in a study conducted in Indonesia, which evaluated the effect of nutrition education in the form of Dietary Approach to Stop Hypertension (DASH) diet booklets on body mass index, waist circumference, mid-upper arm circumference and blood pressure in obese adolescents. It showed that there was also a significant decrease in the BMI of the participants along with other anthropometric measures, i.e. waist circumference and mid-upper arm circumference.[36] A controlled trial among obese adolescents also found a significant decrease in mean body mass index. The trial showed a significant relationship between nutritional education and the BMI of participants for 10 weeks.[37]

The nutritional status of respondents in the control group (LASU) became significantly worse after the intervention. Those with normal weight were reduced, and the proportion of underweight was increased. The worsened nutritional status might have been due to the increased rate of disordered eating. The mean BMI was also statistically significantly less post-intervention**.** The results obtained from these participants who were not subject to nutritional education are like those of similar studies.[37,38]

The mean score for ideal body size was significantly higher post-intervention than pre-intervention among UNILAG students, indicating that the students desired bigger bodies post-intervention. However, the feel-ideal mean difference (i.e. body image dissatisfaction) did not improve post-intervention. This finding contradicts another study that showed a statistically significant difference in body image dissatisfaction after nutrition education.[39] Positive self- and body-image, optimal diet and health perceptions showed huge differences.

The intervention did not reduce BID among the intervention group, but the prevalence among the intervention group was

Table 3: Associations between body image dissatisfaction, disordered eating and body mass index for both groups post-intervention.

	Nutritional status					
	Underweight	Normal weight	Overweight	Obese		
	($n = 135$)	($n = 316$)	($n = 87$)	($n = 47$)		
Variable	Freq (%)	Freq (%)	Freq (%)	Freq (%)	χ^2	*p*-value
Intervention group:						
Body image dissatisfaction						
Dissatisfaction	52 (47.3)	184 (49.2)	53 (73.6)	27 (79.4)	25.38	< 0.001
Satisfaction	58 (52.7)	190 (50.8)	19 (26.4)	7 (20.6)		
Disordered eating behaviour						
Yes	7 (6.4)	19 (5.1)	6 (8.3)	4 (11.8)	3.223	0.358
No	103 (93.6)	355 (94.9)	66 (91.7)	30 (88.2)		
Control group:						
Body image dissatisfaction						
Dissatisfaction	83 (65.4)	198 (58.6)	56 (69.1)	39 (84.8)	13.82	0.003
Satisfaction	44 (34.6)	140 (41.4)	25 (30.9)	7 (15.2)		
Disordered eating behaviour						
Yes	20 (25.6)	43 (12.7)	7 (8.6)	8 (17.4)	2.965	0.397
No	107 (84.3)	295 (87.3)	74 (91.4)	38 (82.6)		

significantly less than that of the control group. The fact that the BID did not decrease significantly in the study population could have been affected by the COVID-19 pandemic, which was ongoing during the research and observed by researchers to increase body image concerns and disordered eating attitudes. The published literature also confirms that body image dissatisfaction increases during pandemics such as the COVID-19 pandemic.[40,41]

Given all this, the intervention effectively addressed body image dissatisfaction among female university undergraduates, which agrees with other studies showing a significant reduction in body dissatisfaction after an intervention.[42,43] The findings are similar to the reports of a randomised controlled trial among female adults in Sweden to explore the efficacy of acceptance and commitment therapy (ACT) based educational courses in different formats for body shape dissatisfaction and positive modest effect on general bodily satisfaction along with improved self-esteem, satisfaction and quality of life.[44]

Post-intervention, the prevalence of disordered eating was higher in both universities, but the difference was significant only among LASU students, indicating a worse scenario of disordered eating behaviour. Moreover, the difference between the prevalence of disordered eating among the two populations post-intervention was statistically significant, indicating that the intervention effectively addressed disordered eating. In Germany, the intervention improved the diet quality of overweight and obese individuals; among medical students in Louisiana, nutrition-based education experience promoted dietary change in new medical undergraduates.[45,46] Multimodal nutritional education intervention focusing on healthy eating promotion effectively improves dietary intake among university students on the East Coast of Malaysia.[47] These interventions significantly affected this specific demographic, especially among students who were exposed to formal education and, thus, received nutritional education.

Post-intervention in UNILAG, students who were obese had the highest percentage of body image dissatisfaction (79.4%), followed by overweight students (73.6%). A significant association between overweight/obesity and body image dissatisfaction has been reported in other studies. The higher prevalence could be linked to increased social media use, which might put adolescents and young adults under body image pressure.[48,49] Although disordered eating attitude was highest among the obese, followed by overweight students, the difference was not statistically significant, unlike other studies, which demonstrated a strong association between eating disorders and the prevalence of obesity.[50,51]

In this study, there was no association between body image dissatisfaction and disordered eating attitudes post-intervention. This result contradicts a previous intervention study, which showed that positive changes in protective factors such as self-esteem and body image flexibility caused a reduction in the symptoms of ED. [52,53]

Post-intervention, the correlation between BMI and body image satisfaction scores was statistically significant in both groups but worse in LASU. This aligns with a 10-year longitudinal study to assess body dissatisfaction from adolescence to young adulthood. In the previous study, increased body image satisfaction was positively associated with increased BMI.[54]

Strength and limitations

Although there is much data on the nutrition of university students, nutrition interventions, especially reliable online programmes, are scarce and scattered. This study demonstrated that online nutrition and lifestyle education can effectively promote healthy behaviours to improve body image, body mass index and disordered eating among female undergraduate students. Other universities can employ this online intervention in any other country. However, regular classes, special seminars on campus, media and other online social media could have influenced learning among undergraduate students.

Conclusion

The intervention effectively reduced body mass index, body image dissatisfaction and disordered eating attitudes. Therefore, online nutrition and lifestyle education significantly improves nutritional status and body image concerns and reduces disordered eating. It can be an effective tool for promoting healthy behaviours among female undergraduate students.

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