

Impact of Professional Nutrition Education on Dietary Behavior and Body Mass Index Status of Senior Clinical Nutrition Students and Dieticians in Saudi Arabia

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ABSTRACT

Background: Dieticians are uniquely qualified to provide nutrition education that can promote healthy lifestyles, reduce the burden of diet related chronic diseases, and improve the quality of life among population.

Objectives: To evaluate the effectiveness of professional nutrition education on changing dietary habits and achievement of normal BMI.

Methodology: A cross sectional study. Subjects were graduates from clinical nutrition departments and other departments of Saudi Universities (n=225). Using internet structured questionnaire focusing on dietary habits before and after college education, physical activity and weight changes to test the impact of education on food habits both on the subject and his/her surrounding environment (family and friends).

Results: Increase consumption of fruits, vegetables, dark green vegetables, whole grain cereals, dairy products, and water and increase physical activities, in addition to decrease consumption of soda, artificial canned juices, energy drinks, solid fat, added sugar, saturated fat and salt were clear among graduates of clinical nutrition departments in comparison to other graduates.

Conclusion: Professional nutrition education positively impact food choices and healthy food habits. This impact is extended to their families and friends.

Keywords: Dietitian, Nutritionist, Healthy Lifestyle, Nutrition Knowledge, Behavior Change, Body Mass Index.

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INTRODUCTION

There are significant relationship between health and education. Studies found that educated people have lower morbidity from both chronic and acute diseases such as heart condition, stroke, hypertension, diabetes and asthma attacks.¹

Completing school years was associated with lower rates of smoking, heavy drinking, using illegal drugs and gaining weight. collage education reduces mortality by 1.8 % points; risk of heart disease by 2.16 % points and the risk of diabetes by 1.3 % points.¹

Healthy lifestyles can prevent the occurrence and severity of chronic diseases, and improve quality of life. Registered Dietitians (RDs), are uniquely qualified to provide nutrition education and interventions that can promote healthy lifestyles in a cost-effective way.²The practice of health knowledge is very essential to get its benefit and to improve the people's health.³

For the RD, practicing their scientific knowledge will affect people choices and change them to healthier foods choices and

selection.⁴ nutritional counseling and education are factors will help to increase the quality of life.⁵

A study found that individuals with high level of nutritional knowledge are more adherent to the recommended carbohydrate intake.⁶ Nutrition education may be an intervention to improve food intake and therefore overall health.⁶

In German universities, a study found that nutrition students had higher levels of dietary restrictions than none nutrition students. Healthy food choices were the same among students in the first year. Advanced levels nutrition students had healthier food choices, when compared to their control group.⁷

A study included first year (n=350) and fourth-year (n=216) Dutch nutrition and dietetics students, compared the dietary intakes of students with the Dutch National Food Consumption Survey (DNFCS), and Dutch RDA to evaluate the impact of education on dietary intake. They found that dietary intake of improved by advancing the level of education and is even better than that of

DNFCS participants. However, reduced intake of Fe, Se and vitamin D (compared to RDA), was reported.⁸

A study in 2017 aimed to evaluate Nutrition and dietetics (ND) and Naturopathic medicine (NM) students for eating attitudes and behavior, found that ND students consumed significantly less added sugar and sugar-sweetened beverages than NM students. However, neither group consumed the recommended daily amount of whole grains or dairy products.⁹

A recent study done at the University of the West Indies St. Augustine, reported more consumption of fruit and vegetable among nutrition compared to and non – nutrition, students. They also had a waist circumference in the normal range.¹⁰

In Saudi Arabia there are many colleges for clinical nutrition such as King Saud University, King Abdulaziz University, Umm al-Qura University, Taibah University, King Khaled University, JAZAN University, and Hail University. Graduates are expected to disseminate accurate nutrition knowledge to their societies, raise the awareness of healthy eating and consequently improve the overall health of the Saudi population and reduce the burden of chronic diseases.

HYPOTHESIS

Professional nutrition education can improve the persons dietary behavior and BMI status

OBJECTIVE

To Evaluate the effectiveness of professional nutrition education on changing dietary habits and achievement of normal BMI among senior clinical nutrition students and dietitians in Saudi Arabia.

METHODOLOGY

Study Design and Area

A cross sectional study. Using internet structured questionnaire directed to graduates from Saudi Universities, both from clinical nutrition and other departments. 310 responded; we excluded 85 for the following reasons: junior students, inaccurate information (non matching question). For incomplete data, communication with the subject was done through whatsapp and e-mails and all the required data were fulfilled.

The questionnaire included open ended and closed questions focusing on dietary habits before and after college education, physical activity, weight status and impact of education on food habits both on the subject and his/her surrounding environment (family and friends).

Subjects (n=225) were enrolled according to inclusion and exclusion criteria, and were divided into two groups:

1. **First group:** Professional dieticians and senior clinical nutrition students (CLN).
2. **Second group:** University senior and graduate students from other departments or collages and hospital employees other than clinical dieticians (non-CLN).

Exclusion Criteria

1. Chronic disorders that have special diet management e.g. diabetes, celiac disease ...etc. or affecting metabolism e.g. hypothyroidism.
2. History of bariatric surgery
3. Intake of medications that could affect weight e.g. corticosteroids, antidepressants, insulin etc.
4. Pregnancy in recent years (within two years)

Ethical approval was obtained from the ethical committee of the faculty of applied medical science, ethical clearance no CLN 201711.

Results were analyzed using SPSS (version 21) T-test was used for continuous data, chi square for categories.

Dietary recommendation for healthy people 2020 were used as a reference guide for healthy eating.¹¹

RESULTS

The study included 225 subjects (112 CLN and 113 none CLN), the majority were females (93.8%). Age ranged from 21 to 51 years old with mean 23.6 ± 3.3 years. Dietary intake before University graduation showed that there was non-significant difference between both groups in the frequency of the intake of fruits, vegetables, soft drinks, fresh juice, canned juice, milk, milk products, energy drinks, fluids, water, caffeine, added sugar, solid fat, saturated fat and salt.

Change in food consumption behavior after graduation among the studied groups is presented in table 1.

Table 1: Statistical comparison in food consumption behavior among CLN & Non CLN graduates after graduation.

Type	Group	Did not change	Decrease	Increase	P-value
Fruits	CLN	29 (26.1%)	9 (8.1%)	73 (65.8%)	.010
	Non CLN	37 (32.7 %)	22 (19.5%)	54 (47.8%)	
Vegetables	CLN	31 (27.7%)	5 (4.5%)	76 (67.9 %)	.001
	Non CLN	38 (33.6%)	20 (17.7%)	55 (48.7%)	
Dark green vegetable, red, orange, beans, peas	CLN	37 (33%)	3 (2.7%)	72 (64.3%)	.000
	Non CLN	59 (52.2%)	14 (12.4%)	40 (35.4%)	
Whole cereal	CLN	21 (18.8%)	3 (2.7%)	88 (78.6%)	.000
	Non CLN	47 (41.6%)	20 (17.7%)	46 (40.7%)	
Soda	CLN	27 (24.1%)	78 (69.6%)	7 (6.3%)	.001
	Non CLN	37 (32.7%)	54 (47.8%)	22 (19.5%)	
Fresh juice	CLN	42 (37.5%)	14 (12.5%)	56 (50%)	.871
	Non CLN	39 (34.5%)	16 (14.2%)	58 (51.3%)	
Canned juice	CLN	44 (39.3%)	61 (54.5%)	7 (6.3%)	.000
	Non CLN	48 (42.5%)	37 (32.7%)	28 (24.8%)	

Milk consumption	CLN	48 (42.9 %)	12 (10.7%)	52 (46.4%)	.207
	Non CLN	51 (45.1%)	20 (17.7%)	42 (37.2%)	
Milk product consumption	CLN	45 (40.2%)	15 (13.4%)	52 (46.4%)	.080
	Non CLN	59 (52.2%)	18 (15.9%)	36 (31.9%)	
Energy drinks	CLN	66 (58.9 %)	44 (39.3 %)	2 (1.8%)	.257
	Non CLN	70 (61.9%)	37 (32.7%)	6 (5.3%)	
Fluid intake	CLN	36 (32.1%)	7 (6.25%)	69 (61.6%)	.092
	Non CLN	30 (26.5%)	17 (15%)	66 (58.4 %)	
Water intake	CLN	17 (15.2%)	8 (7.1%)	87 (77.7%)	.041
	Non CLN	25 (22.1%)	17 (15%)	71 (62.8%)	
Caffeine	CLN	36 (32.1%)	19 (17%)	57 (50.9%)	.048
	Non CLN	34 (30.1%)	8 (7.1%)	71 (62.8%)	
Solid fat (butter and margarine)	CLN	41 (36.6%)	64 (57.1%)	7 (6.3%)	.004
	Non CLN	55 (48.7%)	41 (36.3%)	17 (15%)	
Sugar added to the beverage	CLN	25 (22.3%)	84 (75%)	3 (2.7%)	.000
	Non CLN	44 (38.9%)	48 (42.5%)	21 (18.6%)	
Saturated fat (coconut butter and plants oil)	CLN	48 (42.9%)	57 (50.9%)	7 (6.3%)	.003
	Non CLN	67 (59.3%)	33 (29.2%)	13 (11.5%)	
Salt	CLN	56 (50 %)	52 (46.4%)	4 (3.6%)	.007

Table 2: Statistical comparison between CLN and non-CLN graduates in daily consumption of some unhealthy food (sweets, pickles, fast food and chips) before and after graduation.

	Before university graduation		P-value	After graduation		P-value
	CLN	Non-CLN		CLN	Non-CLN	
Sweet	50.90%	49.60%	0.993	16.10%	37.20%	0.004
Pickles and other high sodium foods	8%	9.70%	0.251	3.60%	4.40%	0.725
Fast food and restaurants	10.70%	12.40%	0.659	5.40%	17.70%	0.011
Chips	38.40%	23%	0.034	9.80%	15%	0.058

Table 3: Statistical comparison between CLN and non-CLN physical activity

	CLN			Non-CLN			P-value	CLN			Non-CLN			P-value
	Before university			Before university				After university			After university			
	≥3 times weekly			≥3 times weekly				≥3 times weekly			≥3 times weekly			
Aerobic exercises	26.9%			41.6%			0.102	52.7%			47.8%			0.307
Anaerobic exercises	12.5%			16.9%			0.897	33.9%			27.4%			0.047
Walking	55.4%			69%			0.009	78.5%			73.4%			0.608
Duration of walking	10-29	30-60	> 60	10-29	30-60	> 60	P-value	10-29	30-60	> 60	10-29	30-60	> 60	P-value
	min	min	min	min	min	min	value	min	min	min	min	min	min	value
	15.2	19.6	3.6	3.5%	35.4	2.7	0.004	16.1	49.1	8%	14.2	42.5	4.4	0.223
	%	%	%	%	%	%		%	%	%	%	%	%	

Table 2 describes the consumption of some unhealthy food (sweets, pickles, fast food and chips) among CLN and non-CLN graduates before and after graduation.

Comparison between the two groups regarding physical activity before and after graduation is described in table 3. Anemia as documented by Hb analysis was prevalent among 18.75% of the CLN group compared to 32.74 % of non-CLN (p=0.016), however, only 40.9% of anemic non-CLN group were compliant to iron therapy compared to 85.7% of CLN (p=0.015). The consumption of refined grain, whole grain or both have a

significant difference between CLN and non-CLN as presented in figure 1 (p=0.000)

Table 4 describes the changes in CLN and non-CLN health and dietary behavior after university.

Table 5 describes impact made by CLN and non-CLN graduates on their families and friends.

Mean BMI in CLN participants before university was 21.49 ± 3.77 Kg/m², compared to 21.95 ± 3.48 Kg/m² after graduation. A higher mean level of BMI was registered among non-CLN after graduation 22.98 ± 4.89 Kg/m² compared to 21.8 ± 4.88 Kg/m².

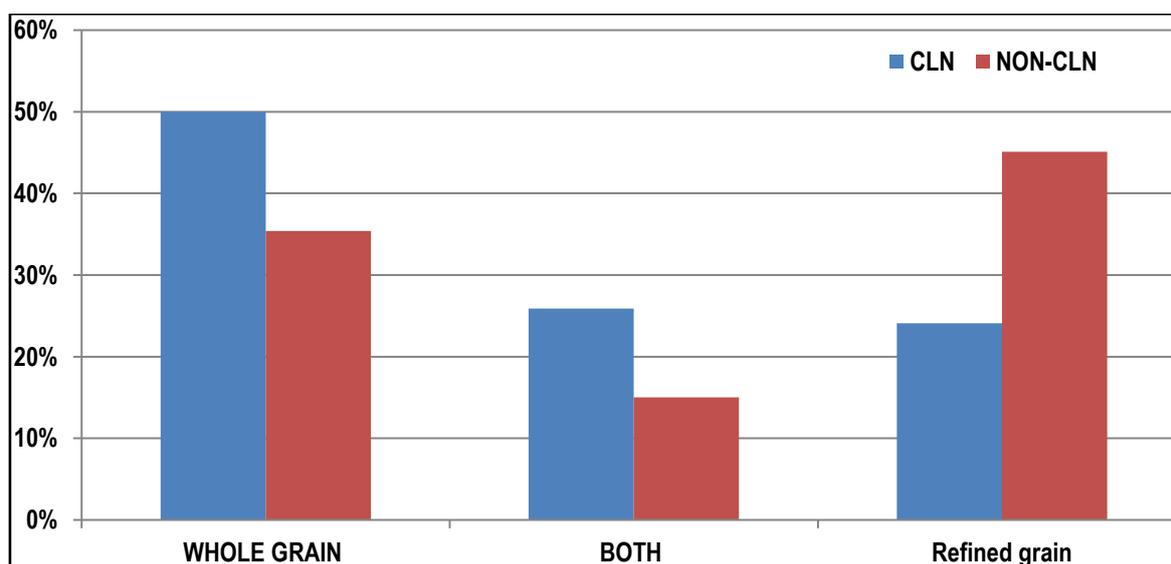


Figure 1: Statistical comparison between CLN and non-CLN graduates in consumption of types of grains

Table 4: Statistical comparison of the change in dietary and health habits between CLN and non-CLN graduates

	CLN	Non-CLN	P value
Increase physical activity	13 (11.6%)	7 (6.2%)	0.154
Increase fruits & vegetables	24 (21.4%)	2 (1.8%)	0.000
Increase milk & milk products	2 (1.8%)	1 (0.9)	0.556
Switch to whole grain	8 (7.1%)	0 (0%)	0.004
Improve health style	43 (38.4%)	8 (7.1%)	0.000
Decrease salt	1 (0.9%)	2 (1.8%)	0.566
Decrease fat	28 (25%)	10 (8.8%)	0.001
Decrease soft drinks	14 (12.5%)	6 (5.3%)	0.058
Decrease sugar and sweet	16 (14.3%)	2 (1.8%)	0.001
Change cook method to healthier	3 (2.7%)	0 (0%)	0.080
Improve health status and awareness	9 (8%)	2 (1.8%)	0.029
Decrease water and fluids	2 (1.8%)	1 (0.9%)	0.556
Increase fast food	3 (2.7%)	16 (14.2%)	0.002
Increase sugar & sweet	1 (0.9%)	1 (0.9%)	0.995
Increase caffeine	3 (2.7%)	4 (3.5%)	0.710
Decrease physical activity	1 (0.9%)	2 (1.8%)	0.566

Table 5: Impact made by CLN and non-CLN graduates students on their families and friends

	CLN	Non-CLN	P value
Increase physical activity	6 (5.4%)	2 (1.8%)	0.146
Increase fruits & vegetables	8 (7.1%)	3 (2.7%)	0.119
Increase milk & milk products	5 (4.5%)	0 (0%)	0.024
Switch to whole grain	7 (6.3%)	2 (1.8%)	0.086
Improve health style	23 (20.5%)	4 (3.5%)	0.000
Decrease salt	5 (4.5%)	0 (0%)	0.023
Decrease fat	28 (25%)	6 (5.3%)	0.000
Decrease soft drinks	15 (13.4%)	5 (4.4%)	0.018
Decrease sugar & sweet	7 (6.3%)	6 (5.4%)	0.775
Change cook method to healthier	18 (16.1%)	1 (0.9%)	0.000
Increase water and fluids	8 (7.1%)	1 (0.9%)	0.017
Improve health status	10 (8.9%)	2 (1.8%)	0.017
Switch to sweetener	1 (0.9%)	0 (0%)	0.314
Decrease caffeine	0 (0%)	1 (0.9%)	0.318

DISCUSSION

The study examined the impact of professional nutrition education on dietary behavior and body mass index status of senior clinical nutrition students and graduated dietitians living in Saudi Arabia.

After finishing collage education, significant difference was found between CLN and non-CLN graduates in changing dietary behavior, increasing consumption of some healthy food e.g. fruits, vegetables, dark green vegetables, whole grain, dairy products and water and reducing the intake of soda, canned juice, energy drinks, solid fat, added sugar, saturated fat and salt in addition changing cooking method to a healthier.

Our results agree with (Rieko Aikawa study) who reported that dietitians increase their consumption of vegetables and yellow and dark green vegetables with increase their experience after graduation.¹²

Rieko Aikawa also found that the mean intake of added sugar decrease with increasing experience in dietary practice from 2.5 ± 3.3 to 2.2 ± 2.9 gm/day.¹² Vanessa Mealha conducted a study in 2013 and found that the mean soda intake was lower among dietetics and nutrition students compared to other graduate students¹³ the previous is matched with our study.

Half of our CLN graduates completely replace refined grains with whole grain (corresponding to healthy people 2020 objective).¹¹ About quarter (25.9%) of CLN included whole grains in their diet but still use refined grain, which could be considered as less than expected outcome. Although general nutrition courses are obligatory University courses in Taibah and other Saudi Universities, given to all graduates at all specialties, yet, 45.1% of non-CLN graduates still entirely depend on refined grains as the main dietary source of carbohydrates.

The frequency of fast food, sweets and chips intake was lower among participants after professional nutrition education, indicating that CLN graduates eating behavior is much healthier. This result agree with Rieko Aikawa who reported that the mean fast food intake decrease with increasing dietitian's experience.¹² Vanessa Mealha also, found that dietitians and nutrition students have lower mean of sweet intake than other graduate students.¹³

The impact of professional nutrition education on adopting healthy lifestyle was clarified by increasing the frequency and duration of physical activity after graduation.

Before graduation, the high percent of non-CLN students used to walk compared to CLN students with the difference highly significant. This difference become non-significant after graduation as more CLN students adapted the exercise of walking. The reduced walking before graduation among CLN students may be related to the high academic load. We found that 78.5% of CLN participants practice walking after graduation, a higher percentage when compared to a study conducted in King Saud University and found that 50.7% of medical students were walking regularly.¹⁴

A study conducted in Saudi Arabia by Abdulmohsen et al, found that the prevalence of moderate physical activity among Saudi population are only 16.8%.¹⁵

Not only anemia was reported at significantly higher frequency among non-CLN graduates, but also a small percentage of them were committed to iron therapy compared to CLN graduates (40.9% and 85.7% respectively).

Al-hassan study reported that 64% of the Saudi University female students are anemic, with hemoglobin less than 12mg%.¹⁶ a much higher prevalence than we found.

Although mean BMI of all participants before and after graduation was within the normal range yet, the weight increases significantly after graduation in both groups. This increase weight after graduation may be explained by the fact that that 93.8% of participants were females of reproductive age, so pregnancy and lactation could be the cause of weight gain, unfortunately, we did not take history of pregnancy.

Result revealed a significant increase in improving attitudes towards healthier eating behavior after graduation by choosing more healthy foods, of good quality and quantity and committing to the three main meals in the same time routinely with adding 2-3 snacks all day long. Rieko Aikawa found in his study that increasing dietitian experience influenced the frequency of snack intake.¹²

Change cooking method to healthier was observed more among CLN-graduates, which matches with WHO recommendations of choosing healthy cooking methods and food low in saturated fat and trans fat.¹⁷

Regardless of the positive impact, we found some negative influence among minority of the CLN graduates who increase their fast food, compared to much high proportion in non-CLN graduates (2.7% vs. 14.2%, $p=0.002$). Both figures are much less than that reported by Al-Otobi who found that fast food consumption is a regular habit that is practiced more than 2 times/week among 47.1% of Saudi female university students.¹⁸

Professional nutrition education not only has clear impact on the nutrition behavior of graduates but also extended to their families and friends, when compared to non-CLN graduates, families and friends of CLN graduates significantly increase their consumption of fruits, and vegetables (and consequently fibers), shifting to whole grains cereals, increase water, decrease soft drinks and increase physical activity and replace unhealthy cook method to healthy one by replacing frying with boiling and steaming.

This finding is consistent with other researches reporting positive health attitudes after clinical nutrition education.⁸

CONCLUSION AND RECOMMENDATIONS

Professional nutrition education positively impact food choices and healthy food habits. This impact is extended to their families and friends. Nutrition and health courses mandatory for Saudi university students have little impact on graduates which indicates that these courses have to be modified to be more effective in changing dietary habits to healthier.

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