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Research Article

Impact of Diet on Symptoms of Anxiety and Depression

Khan S[1] and Khan RA[2]*

[1]Department of Psychology, University of Karachi, Pakistan

[2]Department of Pharmacology, University of Karachi, Pakistan

***Corresponding author:** Khan RA, Department of Pharmacology, University of Karachi, Karachi-75270, Pakistan. Email: rkhan1959@gmail.com

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Abstract

The impact of healthy diet on symptoms of anxiety and depression has been explored before. The present longitudinal study sees through its implementation for the period of two months. The sample consisted of 31 undergraduates, aged 18-22. The results favored the benefits of healthy diet. Considerable decline in the scores of the participant is witnessed throughout the observation period. High dropout rate is the biggest limitation of the study. The reason may lie in it being based upon lifestyle modification treatment which is rather difficult to execute as compared to recommending medications.

Keywords: Anxiety; Depression; Healthy diet; Lifestyle modification treatment

Introduction

Depression is prevalent among masses influencing libido, appetite and sleep and causes lack of interest and motivation, low self-esteem, fatigue and decreased concentration [1]. Though depression influences individuals of all ages, its prevalence is twice among women as compared to men. Adolescence is thought to be the most likely stage of onset of depression as most cases of depression involve individuals under the age of 20 [2]. Anxiety is known as a state of excessive fear accompanied with motor tension, trepidation, risk avoidance and sympathetic hyperactivity [3], which may prevent proper functioning of memory, psychomotor activities and intelligence [4]. 1/8th of the world population suffers from anxiety disorders increasing enormous interest for research in the area of psychopharmacology [5-7]. Depression and anxiety are considered to be the product of the increasing complexity of routine life in modern culture. Chronic pain has been associated with the disorders influencing mood among patients in both developed and developing countries [8-12]. Depression and anxiety both are present among 15-25% of adult population [13]. WHO estimates that depression will be the second leading cause of early death or disability by the year 2020 [14].

Currently, antidepressants are considered to be the number one choice to eradicate depression [15], with most prescription rate of SSRIs [16]. Similarly, chronic and acute anxiety is thought to be best treated with benzodiazepine having as much influence over depressive symptoms as well. But it failed in showing any response among 12-15% of the patients [17]. An analysis clearly presents that use of antidepressants has shot twice as much in the last 20 years in England and other Western countries with concrete evidence showing continuing increase in prescriptions since mid-1970s [18,19]. A research conducted in 2015 indicates overuse of antidepressants claiming that people prescribed or consumed antidepressants may not meet the criteria of mental disorders. Data analysis indicates 69% of the patients used antidepressants in the absence of symptoms of major depressive disorder [20]. Such findings call for an urgent need to develop alternatives, less hazardous and more beneficial in the treatment of anxiety and depression. Traditionally, depression is thought to be more of an emotionally rooted problem or rigorously biochemical disorder in nature where nutrition is found to be significant in commencement, duration and intensity of depression [21]. It was determined that depression and other mental disorder are closely linked with the deficiency of omega fatty acids, vitamins and mineral in the diet of the affected people [22]. B vitamins, mineral, amino acids and omega 3 fatty acids are the antecedents of the neurotransmitters responsible for the occurrence of depression [23-29]. A closer look at the diet of the depressed people reveals that they are careless with their food choices making poor ones that actually add to their depression. A study showed that consumption of chips, biscuits, chocolate and other junk foods causes higher stress and lapses in cognitive functioning [30]. Other studies also linked eating chocolate with high rate of depressions. It was revealed that consuming fruits decreased levels of depression, anxiety and emotional distress as compared to the consumption of chocolates [31-33], whereas addition of fatty acids, vitamins and minerals in the diet can improve a person's mood. Clinical studies and epidemiological data indicate that omega 3 fatty acid has the power to affectively cure depression of a person [34]. Regular intake of 1.5-2mg of Eicosapentaenoic Acid (EPA) has been found to elevate mood [35], while consumption of 0.4mg of vitamin B12, coupled with folate showed remarkable decline in depression [36]. Moreover, provision of nine vitamins for a year greatly enhanced the mood in both men and women [37]. In addition, magnesium is also known to be helpful in decreasing symptoms of depression. In a study, patients given 125-300mg of magnesium (as gylcinate or taurinate) with each meal and before sleep showed huge improvement in major depression in a short period of time [38]. Another clinical study by Hanus et al. showed that magnesium intake significantly reduced anxiety in the patients [39]. Citrus fruits are also capable of elevating mood, this includes grapefruit (citrus paradisi), lime (citrus aurantifolia), orange (citrus aurantium), mandarin (citrus nobilis) and bergamot (citrus bergamia) [40,41]. Citrus paradisi and citrus lime have been found to have anxiolytic and antidepressant properties and boast memory as well [42-43]. A study held in 2009 established that whole food (rich in vegetables, fish and fruits) is linked with lower chances of contracting depression while processed food (fried food, refined cereals, chocolates, processed meat, desserts and high fat dairy products) contributes profoundly in developing depression [44].

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Table 1: Diet plan.

Breakfast Timings	Lunch Timings	Dinner Timings
7.00 to 8.30, 1 Roti with egg or vegetables use carrot and Spinach frequently, 1 -2 oranges Vitamin B complex & Honey 2 table spoondaily	1.00 to 2.00 350 gm boiled rice or 1 and half Roti with fish or mutton 1 glass fresh limon Juice Vitamin D-3	7.00 to 8.30 1 Roti with vegetable Grape fruit, 2-3 walnut 200 mg Vitamin E & magnesium supplement 250-300 mg

*Take plenty of water daily i.e. 7 to 9 glasses. Avoid coffee, candies, chocolates, fried chicken, ice cream, macroni.

Table 2: Score chart for all participants.

Participant #	Zero Day		30 Days		60 Days	
	Anxiety	Depression	Anxiety	Depression	Anxiety	Depression
1	5	21	4	20	-	-
2	13	40	11	29	-	-
3	9	19	8	18	-	-
4	13	39	5	16	-	-
5	14	30	12	6	-	-
6	7	16	3	16	-	-
7	13	22	6	18	-	-
8	19	39	9	23	-	-
9	20	31	7	21	-	-
10	9	18	8	11	-	-
11	8	28	6	19	-	-
12	6	19	2	11	0	7
13	13	18	6	7	5	10
14	11	36	5	12	11	19
15	18	39	3	32	12	27
16	21	33	12	19	8	11
17	15	24	9	22	7	20
18	19	44	7	16	1	1
19	14	31	5	11	12	17
20	6	27	1	16	1	13
21	12	30	10	15	6	22
22	14	23	11	28	8	12
23	8	28	2	14	2	14
24	12	38	6	12	7	10
25	15	33	10	19	4	11
26	4	25	2	15	2	18
27	3	22	3	7	1	3
28	5	7	3	10	1	6
29	7	11	4	24	9	20
30	7	12	0	3	0	6
31	9	14	1	14	3	19

Based on the previous epidemiological study, it was determined that a large number of student population seemed to be suffering from the symptoms of depression [45]. Hence this study is aimed at providing a thorough diet plan to the emerging adults prone to anxiety and depression in order to nip the disorders at the bud. The diet plan (Table 1) particularly focused on the timings of the meals, intake of specific food items with restriction on the use of some dietary elements, it was a longitudinal study stretched over the observation and monitoring period of two months.

Table 3: Summary of diet plan follow-up.

Parameters	Number of Days		
Meal Timings Follow-up	05-20	25-40	45-60
	Number of Participants		
Breakfast (8:30 a.m.)	09	10	12
Lunch (1:30 p.m.)	12	09	10
Dinner (8:30 p.m.)	07	14	09
Supplements Intake			
Vitamin D3	14	09	-
Magnesium	12	05	-
B-Complex	15	05	02
Healthy Diet Intake			
Water (8 glasses/day)	08	08	15
Honey (2 tbsp./day)	08	12	08
Fruit (seasonal)	04	16	11
Avoiding Unhealthy Diet			
Chocolate	07	08	15
Coffee	05	10	16
Macaroni	07	07	16

Materials and Methods

This study was carried out after approval from departmental research committee on the undergraduate students in the faculty of Pharmacy and Department of Psychology; University of Karachi, Pakistan aged 18-22. 94 students filled out the questionnaires. 19 students out of 94 displayed no symptoms of either anxiety or depression. However, 75 students did exhibit symptoms of depression and anxiety ranging from mild to severe. But not all of them agreed to take part in the research; only 49 did and signed the consent form. As the time passed, 18 failed in keeping up with the diet plan and 31 showed up for their first evaluation after 30 days. Later, 11 more students dropped out, leaving 20 students who fully followed the diet plan for two months.

The scale, Centre for Epidemiological Studies-Depression (CES-D), was used to detect symptoms of depression that is a 20-item measure developed by Radlof in 1977 [46]. CES-D evaluates depression based on the frequency of the symptoms such as lack of sleep and appetite and feelings of loneliness, the individuals had in the past week. The response options range from 0-3 for each item. 0 indicates 'seldom' or 'none of the time', 1 signifies 'some' or 'little of the time', 2 refer to 'moderately' or 'much of the time' and the score of 3 meant 'maximum' or 'almost all of the time'. Scores can range from 0-60 with high scores pointing towards the occurrence of severe symptoms of depression.

Symptoms of anxiety were measured using; Generalized Anxiety Disorder 7-item scale (GAD-7) developed by Spitzer et al. (2006). The

Table 4: Comparison between diet plan follow-up and score chart.

Diet Plan Follow-up	No. of Days followed	Average Scores										No. of Participants/ No. of drop-outs at 60 days
		Anxiety					Depression					
		0 Day	30- Day	% Decline	60- Day	% Decline	0 Day	30- Day	% Decline	60- Day	% Decline	
Breakfast Timings	05-20	11.6	6.8	41.3	0.40	96.5	23.7	16.40	30.8	2.7	88	9 /7
	25-40	12.8	6.0	53.1	5.4	57.8	26.9	17.90	33.4	12.3	54.2	10 /3
	45-60	9.60	4.9	49	3.5	63.5	27.8	14.75	47	9.8	64.7	12 /1
Lunch Timings	05-20	10.2	5.3	48	1.1	89.2	20.8	17.25	17	4.3	79.3	12 /7
	25-40	13.0	6.6	49.2	5.0	61.5	30.3	17.10	43.5	11.6	61.7	09 /3
	45-60	10.9	5.6	48.6	4.2	61.4	29.4	15.70	46.5	11.0	62.5	10/0
Dinner Timings	05-20	10.5	5.5	47.6	0	100	23.0	17.80	22.6	0.9	96	07 /5
	25-40	12.2	6.2	49.1	4.4	64	26.9	17.14	36.2	11.5	57.2	14 /4
	45-60	10.4	5.1	51	4.2	59.6	29.0	15.33	47.1	11.0	62	09/0
Vitamin D3 Intake	05-20	11.5	6.7	41.7	3.3	71.3	24.3	17.14	29.4	6.5	73.2	14/7
	25-40	12.3	5.2	57.7	3.5	71.5	32.1	16.77	47.7	11.7	63.5	09/2
	45-60	-	-		-	-	-	-		-	-	-
Magnesium Intake	05-20	12.1	7.25	40	3.4	72	25	17.16	31.3	8.0	68	12/5
	25-40	13.6	4.40	67.6	4.2	69.1	37.4	18.40	50.8	10.2	72.7	05/1
	45-60	-	-		-	-	-	-		-		-
B-Complex Intake	05-20	11.9	6.40	46.2	3.5	70.5	27.6	17.60	36.2	8.6	68.8	15/7
	25-40	9.80	5.20	47	3.4	65.3	20.8	17.40	16.3	12.2	41.3	05/0
	45-60	11.0	5.00	54.5	1.0	91	33.0	11.50	65.1	2.0	94	02/0
Honey Intake	05-20	10.3	6.37	38.1	2.5	75.7	26.5	26.20	1.13	7.5	71.6	08/5
	25-40	11.5	5.75	50	3.2	72.1	24.4	18.50	24.1	8.6	64.7	12/5
	45-60	12.0	6.25	48	4.8	60	28.5	13.80	51.5	8.8	69.1	08/0
Water Intake	05-20	12.3	6.75	45.1	1.5	87.8	25.8	16.50	36	2.1	91.8	08/7
	25-40	8.80	4.00	54.5	1.8	79.5	25.5	18.30	28.2	8.8	65.4	08/4
	45-60	11.9	5.93	50.1	4.9	58.8	27.0	15.10	44	12	55	15/0
Fruit Intake	05-20	12.2	7.25	40.5	-	-	26.5	21.00	20.7	-	-	04/4
	25-40	10.8	5.60	48.1	2.7	80.5	27.4	15.80	42.3	7.8	71.5	16/7
	45-60	11.5	5.50	52.1	5.1	55.6	24.7	16.10	34.8	12.8	48.1	11/0
Avoiding Chocolate	05-20	11.5	6.80	40.8	1.2	89.5	25.0	19.70	21.2	2.5	90	07/5
	25-40	14.0	7.10	49.2	4.0	71.4	30.3	19.75	34.8	6.8	77.5	08/5
	45-60	9.80	4.50	54	3.9	60.2	25.4	13.80	45.6	12.8	48.8	15/0
Avoiding Coffee	05-20	10.8	6.40	40.7	0.2	98.1	22.6	18.80	16.8	1.2	94.6	05/4
	25-40	12.8	7.30	43	2.7	79	28.3	20.50	27.5	6.0	78.7	10/7
	45-60	10.4	4.75	54.3	4.5	56.7	26.3	13.40	49	12.5	52.4	16/0
Avoiding Macaroni	05-20	11.1	5.50	50.4	1.8	83.7	26.0	19.80	23.8	4.7	82	7/5
	25-40	13.0	8.50	34.6	2.1	84.6	27.5	18.50	32.7	4.4	84.3	7/5
	45-60	10.0	4.68	53.2	4.5	55	25.6	14.00	45.3	12.6	50.7	16/0

scores range from 0,1,2 and 3 to the response categories of 'not at all', 'several days', 'more than half of the days' and 'nearly every day'. Score of 5 points towards mild anxiety, 10 indicates moderate while 15 refers to severe anxiety [47] (Table 2 and 3).

Results

Table 4 reveals the average score of anxiety and depression of subjects who followed the diet plan for a specific number of days. A steady decline can be clearly seen. 10 subjects who followed dinner timings for 60 days regularly experienced 59.6% drop in their anxiety and 62% decline in their depression. 8 participants who took honey for 60 days straight witnessed 60% decrease in their anxiety as well as 69.1% in their depressive symptoms. Whereas, only 2 individuals took B-complex for 60 days regularly and the drop in their anxiety and

Table 5: The distinct cases.

Participant #	Zero Day		30 Days		60 Days	
	Anxiety	Depression	Anxiety	Depression	Anxiety	Depression
4	13	39	5	16	-	-
5	14	30	12	6	-	-
8	19	39	9	23	-	-
9	20	31	7	21	-	-
12	6	19	2	11	0	7
16	21	33	12	19	8	11
18	19	44	7	16	1	1
20	6	27	1	16	1	13
22	14	23	11	28	8	12
23	8	28	2	14	2	14
24	12	38	6	12	7	10
25	15	33	10	19	4	11
27	3	22	3	7	0	6
30	7	12	0	3	0	6

depression was 91% and 94% respectively. Moreover, 15 participants drank 8 glasses of water for 60 days saw 55% drop in their depression and 58.8% decrease in their symptoms of anxiety. 15 people who did not have chocolates for two months experienced 60.2% decline in their anxiety and 48.8% in their depression. Finally, participants who avoided intake of coffee for 60 days observed 56.7% drop in their anxiety symptoms and 52.4% decline in their depressive symptoms (Table 4).

Discussion

The longitudinal study conducted was successful in achieving its target. Drastic decrease in the scores of the affected individuals was observed throughout the period of 60 days. Some of the striking cases are mentioned in the (Table 5).

As noticed above, the participants who followed the diet plan most sensibly experienced a blatant difference in their symptoms. When asked about what seemed to be the most beneficial aspect of following the diet plan for two months, 08 participants reported to have better mood, 05 reported to have better sleep and 03 said to have improved relationship with others. While the 11 participants, who had dropped out of the research after one month of follow-up were asked to state the reason of their dropout. 05 reported that the timings of the meal were difficult to follow. Two participants said it difficult to take supplements and the similar number of people considered junk food (coffee, chocolate and macaroni) not easy to avoid. Apart from that, at the time of second evaluation, final examinations of participants were taking place and participants seemed to be tensed about it.

Individual and group meetings were held at the time of evaluations based on the preference of the participants and issues and difficulties were dealt in an easy going atmosphere. Participants who showed slight hesitation and dissent during them were not compelled or convinced to continue with the study and they dropped out whenever they thought convenient. A couple of participants expressed gratitude for being allowed to be a part of the research as it improved their condition a lot.

This study is based on the change in dietary pattern to treat symptoms of depression and anxiety. With the advancement in technology, our lives have been eased. However, this has brought a lot of complications in its wake and is affecting our mental health negatively [48]. A study conducted by Teychenne et al. showed that sedentary behavior is linked with an increased risk of depression [49]. Another study discovered detrimental relationship between fat intake and depression [50]. A study proved that people who consume fast food are 51% more likely to be depressed than those who consume very little or none of harmful food [31]. Poor diet thus plays a major role in giving sustenance to the mental distress [51-53]. Present study demanded major changes in the dietary habits of the individuals which at large affected their sleeping patterns and academic and extra-curricular activities as well. This turned out to be rather difficult to follow for the most. First of all, only those individuals are willing to make a change in their lifestyles that are self-motivated and are not compelled by another agent [54]. This is why, the prospect of this research was announced among students and they came on their own accord. Secondly, knowledge is necessary to make lifestyle changes [55]. Participants were briefed about the dietary importance of the plan they were given by discussing each item separately. Thirdly, despite all the efforts put in, a considerable number of people dropped out. It is because; behavior change is a gradual process, accomplished in stages through which the patient must progress. Not all at-risk individuals will be 'ready' to change.

Many people fail to see behavior modification as a process that takes time. According to the Trans theoretical model of change, a person goes through five stages: precontemplation, contemplation, preparation, action and maintenance. This model is not linear in nature, rather it is spatial. Relapse can occur at any time and should be handled as the part of the process. It is not the relapse but the recovery from the relapse that matters [56]. This is the exact point being overlooked by most of the participants in this research. Moreover, this model also takes into consideration a phenomenon named decisional balance which refers to people weighing the pros and cons of behavior change and the importance they relate to these pros and cons. When the cons of behavior change that can also be called the barriers outweigh the pros of behavior modification, also called benefits, then participants are not willing to undergo the lifestyle change.

Conclusion

The present study sheds light upon the benefits of the healthy diet on the mental health of the people. Diet is not considered meaningful when it comes to treatment of serious disorders when in reality it can play a major role in curbing the mental disorders and maintaining mental equilibrium. However, further studies on larger sample of the patients suffering from anxiety and depression are required in order to gauge the actual impact of healthy diet coupled with that of medication.

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