Frequency of Junk Food and Depression in Children

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Abstract:

Introduction: *Consumption of junk food has a profound detrimental effect on psychological health. Participants who ate commercial foods especially doughnuts were at risk of mental health problems.*

Materials and Methods: *This cross sectional study was conducted at private colleges and the participants were college students whom were selected on the basis of non-probability convenient sampling. The sample size calculation was done using the W.H.O. software. Participants who had completed questionnaire were included and were excluded if they were on antidepressant medication. Questionnaire for this study was the New Zealand Adolescent Frequency Food Questionnaire.*

Results: *majority of the students eat fast food on monthly basis 134(47.3%), while 94(33.2%) eat fast food on weekly basis, 39(13.8%) of the students eat fast food twice weekly and 15(5.3%) on daily basis. Factor analysis showed 24% correlation matrix of eating fast food with drinking fruit juice, 30% correlation with drinking tea or coffee, 37% correlation with milky drinks and 35% correlation with consumption of sugary drinks. The variable of how often you eat sweets showed 33% correlation with you were not able to feel happy, 32% you felt scared, 31% correlation with your sleep was restless and 32% correlation with you felt that people disliked you. One way ANOVA revealed statistically significant results and the Tukey pos hoc test showed that comparison of students from age 20- 25 years eating junk food with depression scores was also statistically significant.*

Conclusion: *This research shows a positive correlation between consumption of junk food and occurrence of depression in children.*

Introduction:

"Eating junk food has a negative effect on mental health, making those who consume it regularly feel depressed,"[1]The news is based on a Spanish study that looked at how 9,000 people's consumption of fast food and baked goods, researchers found that people who consumed the most fast food and baked goods were 37% more likely to become depressed over a six-year period than people with the lowest consumption.[2]In a cohort study of almost 9000 adults in Spain, those who consistently consumed "fast food," such as hamburgers and pizza, were 40% more likely to develop depression than the participants who consumed little to none of these types of food. In addition, investigators found that the depression risk rose steadily as more fast food was consumed. Participants who often ate commercial baked goods, such as croissants and doughnuts, were also at significant risk of developing this disorder.[3]Several studies have analyzed the association between fast food and commercial bakery consumption and physical diseases, such as obesity or coronary heart disease.[4]Consuming healthy foods can reduce the risk of severe depression, while consuming junk food can significantly exacerbate depression and those who consume junk food, where these foods provide nutrients that are less healthy, more likely to experience mental health problems than those who always apply a healthy diet."This study reinforces the hypothesis that a healthy diet has the potential not only to help chase away depression, but also to prevent it.[5] Diet and mental state seem to be tightly entwined, with new research showing an increased risk of depression in junk-food eaters. Consumers of fast food and sweets, compared with those who eat little or none, were 51 percent more likely to develop depression, the new study showed. The researchers saw that as depression levels increased, so did the amount of junk food eaten.[6]Eating commercially baked goods (cakes, croissants, and doughnuts) and fast food (hamburgers, hotdogs, and pizza) is linked to a 51 percent increase in the incidence of depression, compared to those who eat little or none of these foods.[7] Those who

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regularly eat high-fat foods, processed meals, desserts and sweets are almost 60 per cent more likely to suffer depression than those who choose fruit, vegetables and fish.[8]A diet rich in lean meat or fish, whole grains, fruits and vegetables was associated with a lower risk of depression or anxiety, while a junk-food diet-loaded with processed foods, sugary treats and saturated fats-correlated to higher rates of reported depression.[9]In addition to causing obesity, rich foods can actually cause chemical reactions in the brain that ultimately lead to depression.[10]A healthy diet including vegetables, meat, fruit and fishes was associated with lower odds for depression and anxiety disorders whereas diet rich in processed food sugary products was associated with higher depression and anxiety.[11]Nutrition and dietary habits are undeniably linked to mental health. An adequate diet consisting of healthy food is necessary for maintaining good mental health.[12]

Rationale: The aim of this study was to observe the unfavorable role of fast food and commercial baked food eating on the occurrence of depression.

Materials and Methods:

Study Design and Study Cases:
This cross sectional study was conducted at private colleges of Karachi, Pakistan from April 2014 till May 2015. The participants were college students of 20-28 years old and were selected on the basis of non-probability convenient sampling.

Sample Size:
The sample size calculation was done using the W.H.O. software for "Sample Size Calculation" edited by L. Lemeshow and S. K. Lwanga, where α=5%, 1-β=90, Po=0.74, Pa=0.65, n (sample size) =220. The researcher recruited 283 subjects to avoid the chances of type 2 error.

Inclusion/Exclusion Criteria:
Participants were excluded if they had a history of diabetes, were users of antidepressant medication or had reported a previous clinical diagnosis of depression. Additionally, participants with missing values for BMI were also excluded from the analyses. Finally 250 participants who had completed questionnaire were included in the present study.

Questionnaire
Questionnaire for this study was the New Zealand Adolescent Frequency Food Questionnaire (NZAFFQ). The food questionnaire is made up of three sections: The first section contains 12 multiple-choice questions on general eating habits, including intakes of food group servings, meal consumption patterns and frequency of takeaway consumption. The NZAFFQ was produced by combining and modifying the Health Behaviour in School-aged Children (HBSC) FFQ[11] and the Children's Dietary

Questionnaire (CDQ).[12]These FFQs were developed to describe food patterns of children and adolescents and therefore contain only a limited list of food items. In particular, the HBSC FFQ included 15 items covering the most commonly consumed foods known to be important sources of fibre and calcium among European youth.

The CDQ included 28 items described as 'encouraged foods' (fruits, vegetables, water, reduced fat products) and 'discouraged foods' (high fat or sugar foods, sweetened beverages and full fat dairy products) for adolescents in Australia. These two validated questionnaires formed the basic construct of the NZAFFQ as they covered different important aspects (i.e. variety and intake frequency) of an adolescent's diet and have been used to derive index-based dietary patterns.[13,14,15] Section 2 of the food questionnaire assessed 'usual consumption 'of 32 food items, covering 15 items from the HBSC FFQ[11]and included extra questions on food groups relevant to the New Zealand adolescent population. Changes to the original HBSC FFQ included the addition of questions on consumption of meats and different types of soft drinks.

Although a specific time frame for 'usual' was not defined, we believed that this was likely to cover the period of the previous four weeks, based on results of our pretesting group interviews. For the last section of the NZAFFQ (Section 3), we assessed intakes of 13 fruits, 22 vegetables and 7 miscellaneous foods consumed in the past seven days, as in the original CDQ.[16]To improve face validity of the NZAFFQ, dietitians were consulted to review this FFQ.

Test-retest reliability
The median Spearman's correlation coefficient (SCC) between the two administrations of the NZAFFQ was 0.71, and SCCs ranged from 0.46 for fruit juice or cordial to0.87 for non-standard milk (Table 2). The median ICC was 0.69 (range 0.26-0.92) and 71% (24 of 34) of the food groups had ICCs above 0.6.[17]

Relative validity
As shown in Table 2, SCCs above 0.3 were seen for over two-thirds (23) of the 34 food groups in the FFQ. The median SCC was 0.40, and individual SCCs ranged from 0.04 for convenience foods to 0.70 for standard milk (whole-fat milk). High correlations (SCC $\geq$ 0.50) were observed for breakfast cereals, milk (standard and nonstandard), eggs, sweet bakery products and sweet snack bars. Overall, the exact agreement between the methods in ranking participants into thirds was highest for meat alternatives (78%), but lowest for red or yellow vegetables and potatoes (27%).[17]

The Center for Epidemiological Studies Depression Scale for Children (CES-DC)

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The CES-DC is a 20 item self-report depression inventory with a possible scores ranging from 0 to 60. Each response to an item is scored as follows: 0 = "Not At All", 1 = "A Little", 2 = "Some", 3 = "A Lot." However, items 4, 8, 12 and 16 are phrased positively, and thus are scored in the opposite order: 3 = "Not At All, 2 = "A Little", 1 = "Some", 0 "A Lot"

Higher CES-DC scores indicate increasing levels of depression. Weissman et al. (1980), the developers of the CES-DC, have used the cutoff score of 16 as being suggestive of depressive symptoms in children and adolescents. That is, scores over 16 can be indicative of significant levels of depressive symptoms.[18,19]

Results:

Descriptive Statistics, Test of Normality, Test of Homogeneity of Variances and ANOVA of Depression Scores

The one-way analysis of variance (ANOVA) was used to determine whether there are any statistically significant differences between the means of three independent groups of age after meeting the six assumptions.

> **Assumption 1:** The dependent variable was depression scores which was a continuous variable.
> **Assumption 2:** The independent variable of age had three categories.
> **Assumption 3:** There was independence of observations, indication no relationship between the observations in each age group or between the groups themselves. There were different participants in each group with no participant being in more than one group.
> **Assumption 4:** There were no significant outliers.
> **Assumption 5:** The dependent variable of depression was normally distributed for each category of the independent variable.
> **Assumption 6:** There was homogeneity of variances.

There was a statistically significant difference between groups as determined by one-way ANOVA ($F(2,169) = 12.01$, $p = .00001$). The Tukey post hoc test revealed that comparison of students from age 20 - 25 years eating junk food with depression scores was statistically significant. Table1.

Among the participants 43(15.2%) were male and 240(84.8%) were females. 269(95.1%) of students ranged between 15-24 years of age. 197(69.6%) of the students were college students, 75(26.5%) were university students and only 7(2.5%) were school going.

The data shows that majority of the students eat fast food on monthly basis 134(47.3%), while 94(33.2%) eat fast food on weekly basis, 39(13.8%) of the students eat fast food twice weekly and 15(5.3%) on daily basis.

252(89.0%) students drink fruit juice and most of them 95(33.6%) drink fruit juices weekly. Artificially sweetened drinks were consumed by 211(74.6%) of the students but it was consumed on monthly basis by highest percentage of students i.e85(30%) students. 206 students drink milky drinks and among them 76(26.9%) drink them on daily basis.

Tea or coffee was consumed by 185 (65.4%) of students and among them 158 (55.8%) consumed daily. Among milky drinks 206 (72.8%) students consumed them and 76 (26.9%) of these drinks were consumed on daily and 58 (20%) on weekly basis.

Chocolaty drinks were consumed by 147 (51.9%)of students and among them 25 (8.8%) of them consumed on daily basis. Among them 67 (23.6%) of students consumed them on monthly basis.

Sugar added drinks were consumed by (80%) of students and among them44 (15.5%) of students consumed daily and 71 (25%) of students consumed them on monthly basis.

Breakfast cereals were consumed by 128 (45%) of students and among them 57 (20%) of students daily and 36 (12.7%) consumed on weekly basis.

White bread or bun was consumed by 164 (58%) of students and among them 50 (17.7%) of students consumed daily. Rice, pasta or noodles was consumed by 209 (73%) of students and among them 100 (35%) consumed daily and 82 (29%) of students consumed on weekly basis.

Cheese was consumed by 179 (63%) of students and among them 99 (35%) consumed on monthly basis.

Standard milk was consumed by 226 (79%) of students among them 126 (44.5%) consumed on daily basis. Yogurt was consumed by 238 (84%) of students and among them 44 (15.5%) consumed daily and 93 (32%) of students consumed on weekly basis.

Poultry was consumed by 234 (82%) of students and among them 47 (16.6%) consumed daily and 78 (27%) consumed on weekly basis.

Eggs were consumed by 248 (87.6%) of students and among them 58 (20.5%) consumed daily, 76 (26.9%) consumed twice a week and 73 (25.8%) consumed on weekly basis.

Nuts or seeds were consumed by 233 (78%) of students among them 26 (9%) consumed daily, 31 (11%) twice a

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week, 48 (17%) weekly and 119 (42%) consumed on monthly basis.

Legumes were consumed by 159 (56%) of students among them 68 (24%) consumed on weekly basis.

Red meat was consumed by 208 (71%) of students among them 10 (3.5%) consumed daily, 66 (23.3%) consumed twice a week, 80 (28.3%) consumed weekly and 44 (15.5%) consumed on monthly basis.

Fish and sea food was consumed by 233 (82%) of students and among them 6 (2%) consumed daily, 23 (8%) twice a week, 59 (20.8%) weekly, 147 (51.9%) on monthly basis.

Fruits were consumed by 275 (97.2%) of students and among them 136 (48%) was consumed on daily basis, 75 (26.5%) was consumed twice a week, 51 (18%) weekly, and 12 (4.2%) was consumed on monthly basis.

Cruciferous vegetables were consumed by 217 (76.7%) of students and among them 17 (6%) consumed daily, 51 (18%) twice a week, 97 (34.3%) weekly and 8 (20.5%) consumed on monthly basis.

Green leafy vegetables were consumed by 244 (86.2) of students and among them 44 (15.5%) consumed daily, 75 (26.5%) consumed twice a week, 94 (33.2%) consumed weekly and 36 (12.7%) consume on monthly basis.

Marrow like vegetable cucumber was consumed by 237 (83.7%) and among them 72 (25.4%) consumed on weekly basis.

Red or yellow vegetables were consumed by 237 (83.7%) and among them 92 (32.5%) were consumed on weekly basis.

Potatoes were consumed by 271 (95.8%) and among them 90(31.8%) consumed daily, 88 (31.1%) consumed daily and 70 (24.7%) consumed on weekly basis.

Sweet bakery products were consumed by 254 (89.8%) and among them 31 (11%) consumed daily, 57 (20.1%) consumed twice a week, 87 (30.7%) consumed weekly and 79 (27.9%) consumed on monthly basis.

Sweet snack bar was consumed by 206 (72.8%) and among them 67 (23.7%) consumed on weekly basis.

Nut spread was consumed by 128 (45.2%) and among them74 (26.1%) consumed on monthly basis.

Ice cream was consumed by 273 (96.5%) and among them101 (35.7%) consumed on weekly basis.

Sweets were consumed by 245 (86.6%) and among them 49 (17.3%) consumed daily, 67 (23.7%) consumed twice a week and 76 (26.9%) consumed on weekly basis.

Convenience food was consumed by 264 (93.3%) and among them165 (58.3%) consumed on monthly basis.

Savory biscuits and crisps were consumed by 251 (88.7%) and among them 61 (21.6%) consumed daily 67 (23.7%) consumed twice a week, 80 (28.3%) consumed weekly and 45 (15.9%) consumed on monthly basis.

Factor Analysis: Correlation Matrix of screening how often do you eat fast food with the variable of how often you drink fruit juice showed 24% correlation, 30% correlation with how often you drink tea or coffee, 37% correlation with how often you drink milky drinks and 35% correlation with how often you take sugary drinks.
The variable of how often you eat sweets showed 25% correlations with the variable of how often you eat fast food, 37% correlation with how often you drink fruit juice and 35% correlation with how often you take sugary drinks.

The variable of how often you eat sweets showed 33% correlation with you were not able to feel happy, 32% you felt scared, 31% correlation with your sleep was restless and 32% correlation with you felt that people disliked you. Table 2

Kaiser-Meyer-Olkin measure of sampling adequacy was 0.69 indicating that patterns or correlations are relatively compact. In this research the value of Bartlett's test of Sphericity is highly significant ($p < 0.0001$). Table 3

In the factor analysis model, principal component analysis, method varimax was used. Eigen values are shown associated with each linear component (factor) before and after extraction. Analysis shows 37 linear components within the data set. The eigen values associated with each factor represent the variance explained in percentage by that particular linear component. Factor 1 with eigen value 5.8 has been extracted, which explains large amount of variance 25.74% whereas subsequent factors explain only small amounts of variance. The eigen value associated with this factor is again displayed along with percentage of variance explained in the column labeled *Extraction Sums of Squared Loadings.* The eigen value in this portion of the table is the same as the value before extraction except that the values for the discarded factors are ignored. Table4. Scree plot is the graphical presentation of eigen values against all the factors. This graph is useful for determining how many factors to retain. The point of interest is where the curve starts to flatten. It can be seen that the curve begins to flatten after factor 12. Factors 13 till 37 have eigen value less than 1, so only factors 1 to 12 have been retained, graph 1.

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Discussion:

Most of the participants were of age range 20-28 years (95.1%) and majority were college students (69.6%). Majority of participants consumed fast food on monthly basis (47.3%). Artificially sweetened drinks, milky drinks and sugar added drinks were consumed by (72.8%, 72.8%, 80%) of the participants respectively. Bakery items, savory biscuits and sweets were consumed by (89.8%, 88.7%, 86.6%) of the participants respectively. Most of the Participants also consumed poultry (82%) and eggs (87.6%).

Participants who eat fast food have less consumption of fruit juices, milky drinks and sugary drinks. Majority of the students eat fast food on monthly basis (47.3%), while (33.2%) eat fast food on weekly basis, sweet bakery products were consumed by majority on weekly basis (30.7%), artificially sweetened drinks were consumed majority on monthly basis (30%), meat was consumed by weekly basis (28.3%), fish was consumed on monthly basis by majority (51.9%), cereals were consumed by majority daily (20%), these results are similar to study conducted on students of three European countries.[10]

Sánchez-Villegas A1, Toledo E, de Irala J, Ruiz-Canela M, Pla-Vidal J, Martínez-González MA showed a positive relationship between the consumption of fast food and risk of depression. In addition consumption of commercial baked foods was also optimistically associated to depressive disorders.[20] Akbaraly et al found a significant association between the adherence to a processed food pattern and depressive symptoms using CES-D scale after 5 years of follow up.[21]

Some studies have recommended that high-fat, low-carbohydrate ketogenic diets can disturb cognition[22] Diets rich in saturated or total fats can increase free radical production and promote pro-inflammatory states.[23,24] These diets induced oxidative damage and inflammation is associated with reduced expression of BDNF (brain-derived neurotrophic factor), lower neuronal plasticity and poorer cognitive ability in animal models.[24] BDNF is a neurotrophic related to several actions such as synaptic plasticity, neuronal survival and differentiation. Moreover, its levels have been reduced among depressed patients.[25]

Conclusion:

This research shows a positive correlation between consumption of junk food and occurrence of depression in children.

Recommendations:

Eating junk food has detrimental effects on health which may include depression. Therefore it is necessary that prospective studies should be conducted to authenticate this fact more and also aware people about junk food's adverse effects. Eating habits should be improved towards healthier diet which may improve mental health.

Table 1 Descriptive Statistics, Test of Normality, Test of Homogeneity of Variances and ANOVA of Depression Scores

Descriptive Statistics		
Age	**Mean**	**Standard Deviation**
20-22	13.9483	1.30347
23-25	16.0526	1.04234
26-28	14.1228	1.50084
Test for Normality		
Age	**Shapiro-Wilk**	
20-22	0.21	
23-25	0.29	
26-28	0.55	
Test for Homogeneity of Variances		
Levene Statistic	***p* value**	
8.616	0.35	
ANOVA		
F statistic	***p* value**	
12.015	0.0001	
Multiple Comparisons between different Age Groups of Depression Scores		
Statistically significant difference between groups verified by Tukey Post hoc test.		
Age	***p*-values**	
20-22 compared with 23-25	0.0001	
26-28	0.751	
23-25 compared with 26-28	0.001	

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Table 2: Factor Analysis-Correlation matrix

Variables		Correlations
how often do you eat fast food	how often you drink fruit juice	24%
	how often you drink tea or coffee	30%
	how often you drink milky drinks	37%
	how often you take sugary drinks	35%
how often you eat sweets	how often you eat fast food	25%
	how often you drink fruit juice	37%
	how often you take sugary drinks	35%
how often you eat sweets	you were not able to feel happy	33%
	you felt scared	32%
	your sleep was restless	31%
	you felt that people disliked you	32%

**Table 3: Factor Analysis-Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.69
Bartlett's Test of Sphericity Sig.	0.0001

Table 4: Factor Analysis-Total Variance Explained & Eigen Values

Component	Initial Eigen Values			Extraction Sums of Squared Loadings		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	5.886	25.744	25.744	3.886	25.744	25.744
2	4.849	8.806	22.549	3.549	8.806	22.549
3	4.500	7.143	29.692	3.200	7.143	29.692
4	4.350	6.428	36.120	2.350	6.428	36.120
5	3.289	6.138	42.259	2.289	6.138	42.259
6	3.153	5.491	47.750	2.153	5.491	47.750
7	3.112	5.294	53.044	1.812	5.294	53.044
8	2.087	5.176	58.220	1.587	5.176	58.220
9	2.922	4.390	62.610	1.376	4.845	62.610
10	1.890	4.237	66.847	1.245	4.265	66.847
11	1.855	4.071	70.918	1.123	3.754	70.918
12	1.808	3.846	74.764	1.121	3.288	74.764
13	.754	3.592	78.356			
14	.717	3.543	79.769			
15	.698	3.512	80.95			
16	.687	3.481	81.76			
17	.675	3.421	82.55			
18	.673	3.398	83.76			
19	.684	3.374	84.83			
20	.698	3.352	85.98			
21	.691	3.326	85.99			
22	.688	3.319	86.12			
23	.682	3.299	86.19			
24	.678	3.287	86.76			
25	.672	3.278	86.89			
26	.669	3.269	86.97			
27	.665	3.259	87.12			
28	.659	3.254	87.26			

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29	.653	3.249	87.39
30	.649	3.239	87.98
31	.638	3.187	88.18
32	.608	2.895	89.976
33	.549	2.615	90.590
34	.541	2.576	93.167
35	.523	2.491	95.658
36	.475	2.260	97.918
37	.437	2.082	100.000

Scree Plot
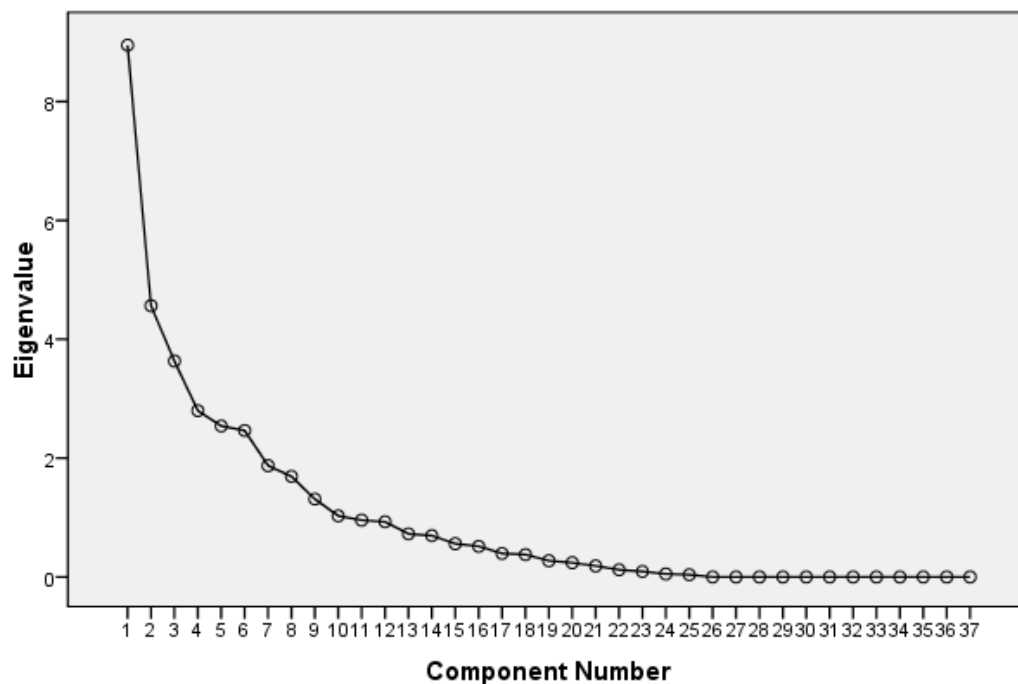
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