

# Management of nicotine induced anorexia with food cravings

Syed Mohammad Umair, Shaziya Javed and Deeksha Kapoor

A retrospective observational study was conducted on 50 adult male smokers and 50 Non-smokers to study the food cravings for the management of nicotine induced anorexia in current smokers. Results of the study showed strong correlation between smoking and food and tobacco cravings. The average daily dietary intake of subjects was significantly less in non-smokers. Flesh foods were consumed more by smokers (69% adequacy) as compared to non-smokers (64% adequacy). Vegetables were consumed significantly high by non-smokers (78% adequacy) than smokers (46.90 % adequacy). Oils and Fats were consumed more by smokers (86% adequacy) as compared to non-smokers (79% adequacy). Thus as predicted a significant difference was found in food cravings where smokers were found to crave more for Tea (48%), meat (54%), salty snacks (40%), dairy fats (24%) and flesh foods (27%). It was also found that smokers craved more for salty taste (50%) while non smokers craved more for sweet taste (54%). Outcome of the study revealed that North Indian, Non-vegetarian, urban smokers had strong food cravings for specific food items and snacks in spite of significant appetite loss due to Nicotine Induced Anorexia.

**Key Words :** Retrospective observational study, Tobacco smoking, Nicotine induced anorexia (NIA), Food cravings

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## INTRODUCTION

Nicotine Induced Anorexia (NIA) being one of the major non cardio-pulmonary problems commonly observed in cigarette smokers. There are many studies regarding the cardio-pulmonary problems in present smokers as well as weight gain problems in past smokers as it has been widely noted that people increase their food intake and gain weight after quitting smoking (Williamson *et al.*, 1991) but unfortunately there is very

little experimental evidence available regarding the problem of nicotine induced anorexia and low BMI in current smokers and its management by utilizing the smokers own food cravings. Though it has been widely reported that nicotine decreases food intake and cigarette smokers generally weigh less and are leaner than non-smokers (Rubinstein and Low, 2011). It's a common knowledge that smokers have generally Low appetite, low Basal Metabolic Index (BMI) and eventually low body weight with respect to non-smokers or past smokers especially in poor and illiterate males (Ankur *et al.*, 2011). To the best of our knowledge no scientific attempt is available to explore the relationship between tobacco and food cravings in present smokers. Smoking could lead to weight loss by mainly three metabolic processes, that is, Increasing the metabolic rate (BMR), Decreasing metabolic efficiency or Decreasing caloric absorption (reduction in appetite) mainly due to Nicotine Induced

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Anorexia (Young-Hwan *et al.*, 2002). All of which are associated with tobacco use (Audrain and Benowitz, 2011). Besides its metabolic properties nicotine induced anorexic effect has been proved by several cross sectional studies indicating that mean BMI tended to be lower among smokers than among non-smokers in many populations. Smoking causes about 90 per cent of tobacco's nicotine to enter our body. It was postulated that acute one-cigarette smoking can negatively affect ghrelin levels in saliva that might contribute to the dull food taste in smokers. Loss of appetite, anorexia nervosa, diminished food taste, and weight loss are common in chronic cigarette smokers. Moreover Smoking can affect the shape of taste buds and also affect vascularization while nicotine may cause functional and morphological alterations of taste buds (Pavilidis *et al.*, 2009). In spite of severe anorexia, current smokers have been found to possess strong cravings for certain tastes, foods and snacks like high fats and starches (Pepino and Mennella, 2007). Cravings differ from hunger as they tend to be more intense and specific for the kind of food desired (Hill, 2007).

According to few studies, food cravings have been viewed as an equivalent to addiction due to their dependence on the ratio of dopamine to acetylcholine in brain (White *et al.*, 2001). Some studies found that smoking decreased sweet taste sensitivity (Sato *et al.*, 2002), others found opposite (Pursell *et al.*, 1973) or no (Peterson *et al.*, 1968; Pomerleau *et al.*, 1991; Redington, 1984) effects. Differences in psychophysical methodology, recency of smoking and lack of information on the subjects' smoking history may have contributed to these mixed results (Pepino and Mennella, 2007). Typical weight loss due to smoking is probably a result of reduced calories intake and increased daily energy expenditure. It was also reported that smoking a single cigarette induced a 3% rise in energy expenditure within 30 minutes. Smoking a cigarette may also serve as a behavioural alternative to eating, resulting in decreased food intake (Chiolero *et al.*, 2008). The main objectives of the study were to find out the relationship between tobacco and food cravings in current smokers as well as impact of smoking on the diet and nutrient intake in current smokers and non smokers in order to identify and tabulate the flavours and food articles generally desired by the smokers during craving episodes.

## METHODOLOGY

### Locale of study :

The study was conducted in the campus of Aligarh Muslim University, Aligarh, India situated in Uttar Pradesh west region 120 km from National Capital Region (NCR) and the subjects were recruited from the staff of the Aligarh Muslim University.

### Inclusion and exclusion criteria of the subjects :

Only individuals meeting the following criteria were allowed for the study:

- Age – 18 to 65 years
- Gender – males only
- Education- above High School (able to read and write English)
- Non-vegetarians only
- Tobacco cigarette smoker and Bidi smokers only
- Current smokers ( $\leq 15$  to  $\geq 25$  cigarettes / day)
- Non-smoker  $\leq 20$  cigarettes / lifetime

### Individuals meeting the following criteria were excluded from the study:

- Smoking other than cigarette and *Bidi* like *Huqqah*, pipe, cigar etc.
- Existing critical illness like diabetes, hypertension, epilepsy, cardio-vascular disorders, thyroid disorders.
- With any existing eating or feeding disorder like anorexia nervosa, bulimia, dysphagia, recent dental operations or implants etc.
- Alcoholics and drug addicts
- Past smokers
- Females

### Design of the study :

This present study was a Retrospective-Observational survey. An inductive approach was used to gain qualitative valid information from the subjects regarding smoking and food cravings. Thus only smokers and non-smokers were selected as pre-defined criteria instead of random sampling. All of the participants were contacted in person and obtained a written consent before their joining as volunteers for the study. After that each volunteer underwent a 10 minute pre-screening counselling session in order to provide them firsthand information about the study and details of questionnaire to be filled by them.

**Period of investigation and data collection :**

The raw data for the present study was collected from January 2014 to May 2016 by conducting the interview cum questionnaire sessions of each of the 100 participants.

**Tools of the study :**

The tools for study included the pre-test, questionnaire, food frequency method and anthropometric measurements.

**Assessment of food intake :**

The food intake of subjects was collected using food frequency table. This method was the mainstay in our study as it was easy for subjects to complete and self administered. The participants were asked about the food eaten per day on average during the past one month. Thereafter amount of foods subjects consumed during one month was converted into a single day amount of the particular food. Finally every measured food item for one day was analyzed into four major nutrients that are energy, protein, fat and carbohydrates. The values so obtained were then compared with RDA (ICMR, 2010) values. Only the frequency of food items intake was taken and the food items were given the portion sizes using the comprehensive food exchange list.

**Food craving assessment:**

The food craving assessment of smokers and non smokers were obtained by using the specific questionnaire having food groups and asking the subjects about their likeness for different food items over one month period. We employed one of the most extensively validated methods for the assessment of food cravings that is, Food

Cravings Questionnaires (FCQs) in the form of Food Craving Inventory (FCI) which measure food cravings using simple tables (White *et al.*, 2001).

**Data analysis :**

After collecting the data, it was analysed using different statistical tools and measures. The Data was expressed as Mean  $\pm$  Standard Deviation. The numerical variables like Food Intake and Nutrient Intake were compared and analysed based on the averages of these parameters in the two separate populations or groups (*i.e.*, smokers and non-smokers) using t-test and the p-value was calculated to find the significance (Pearson, 1900). The analysis of the characteristic like taste cravings and food cravings was done using Chi-square test. Henceforth the p-value was calculated to find the significance of these parameters in the two groups (Wasserstein *et al.*, 2016).

**OBSERVATIONS AND ASSESSMENT**

Results of the study are presented herewith:

**Food intake of subjects :**

The food intake of subjects was assessed using the food frequency method (Annexure-1) and the results obtained are presented below.

Based on the various Food Groups, food intake of the subjects, and Food adequacy was calculated and presented in Table 1.

On analysing the Table 1 and Fig. 1, it was inferred that in general both smokers and non-smokers consumed less diet per day with respect to recommended dietary allowances (RDA). Smokers were found to consume significantly less amount of milk and milk products (51.7% Adequacy) than non-smokers (60.6% Adequacy).

**Table 1 : Mean  $\pm$  SD food intake of subjects per day**

Food groups	Intake (g/day) Mean $\pm$ SD		RDA (g/day) Sedentary work	Food adequacy (%)		P- value
	Smokers (n=50)	Non-Smokers (n=50)		Smoker	Non-Smoker	
Milk and milk products	155.1 $\pm$ 42.3	181.8 $\pm$ 42.5	300	51.7	60.6	.001*
Cereals and grains	198.2 $\pm$ 50	298.4 $\pm$ 52.9	375	52.85	79.57	.0036*
Pulses <sup>##</sup>	62.2 $\pm$ 14.2	47.4 $\pm$ 12.1	75	82.29	63.2	.005
Green leafy vegetables	39.12 $\pm$ 9.3	40.22 $\pm$ 11.4	100	39.12	60.22	.48
Roots and tubers	105 $\pm$ 23.5	122.72 $\pm$ 29.7	200	52.5	61.36	.07
Other vegetables	109.30 $\pm$ 18.6	118.02 $\pm$ 25.1	200	54.65	59.01	.01
Fruits	18.4 $\pm$ 5.5	35.26 $\pm$ 7.4	100	18.4	35.26	.00001*
Sugar	19.0 $\pm$ 4.6	27.28 $\pm$ 5.9	20	95	136.4	.00001*
Oils and fats	30.1 $\pm$ 6.3	24.8 $\pm$ 6.19	25	120.4	99.2	.03*

<sup>#</sup>Balanced diet for male adults, Dietary guidelines for Indians, NIN 2011

<sup>##</sup>Including flesh foods

\*Significant (P-values calculated using T- test at 0.05 level of significance)

**Annexure 1 : Food frequency questionnaire**

Sr. No.	Food groups and items and their exchanges	Average use last three months								
		6+ Per day	4-6 Per day	2-3 Per day	1 Per day	5-6 Per WK	2-4 Per WK	1 Per WK	1 Per month	Never
1.	Milk (1 Cup) Buffalo 250 ml Skimmed Full cream Half toned Full toned Milk (1 Cup) Cow 250 ml Skimmed Full cream Half toned Full toned Milk (1 Cup) Goat 250 ml Full cream Milk products Yogurt / curd ( 1 cup) (250 ml) Cottage cheese (1 slice/ 2 tablespoon)(15 g) Paneer ( 1 cube)(33 g)									
2.	Cereals and grains (20 g) Bread White bread(1 slice) (29 g) Brown bread(1 slice) (31 g) Chapati (1 serving) (22 g) Paratha (1 serving) (26 g) Rice (1/2 katori) (19 g) Rusk (1 piece) (12 g) Mathri (1 piece) (25 g)									
3.	Pulses and legumes Moth beans (1 katori)(30 g) Cowpea (1 katori)(29 g) Lentil (3/4 katori)(28 g) Bengal gram (3/4 katori)(41 g) Soyabean (1 katori)(16 g) Green gram,whole (3/4 katori )(29 g) Green gram, dal (3/4 katorigm)(29 g) Peas,dry (1katori)(35 g) Rajmah (3/4 katori)(30 g) Red gram, dal (3/4 katori)(31 g)									
4.	Flesh foods Meat (lamb/Sheep) (1 peice)(70 g) Poultry(chicken) (1peice)(60 g) Organ meat(Kidney/ liver)- (1 peice )(35 g) Fish ( 1peice) (70 g) Egg (1 egg) (40 g)									

*Annexure 1 contd...*

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Contd.. Annexure 1

Sr. No.	Food groups and items and their exchanges	Average use last three months								
		6+ Per day	4-6 Per day	2-3 Per day	1 Per day	5-6 Per WK	2-4 Per WK	1 Per WK	1 Per month	Never
5.	Green leafy vegetables/Other vegetables/Rootsand tubers/ Seeds (Veg.A=100 g; Veg.B=2 exchanges of Veg.A) Mustard (3 tablespoon)(109 g) Bathua (1 cup)(121 g) Methi sag (1 cup)(117 g) Spinach (1 cup)(121 g) Reddish leaves (1 cup)(146 g) Reddish (1/2 cup)(125 g) Carrot (1/2 cup)(125 g) Cabbage ( 1 cup)(76 g) Cauliflower (1 cup)(88 g) Beans (3 tablespoon)(97 g) Peas (3 tablespoon)(44 g) Potatoes (1/2 cup)(66 g)									
6.	Fruits (1 medium) Vitamin C rich fruits including: Orange (1small)(92 g) Lemon (1 medium) (35 g) Kino (1 medium)(92 g) Guava etc.(1 medium)(89 g) Banana (4 medium)(37 g) Apple/pear (1 small)(75 g) Mango (1 small)(59 g) Melon musk (1 bowl)(286 g) Nuts and dried fruits Groundnut (1 tablespoon)(13 g) Cashew nut (2teaspoon)(22 g) Walnut (2teaspoon)(16 g) Almond (1 spoon)(8 g) Raisin (1tablespoon)(13 g)									
7.	Do you add any of the following when preparing the food Sugar (1 teaspoon) (5 g) Jaggery (1 teaspoon) (5 g) Butter/Margarine (1 teaspoon) (5 g) Ghee (1 teaspoon) (5 g) Oil (1 teaspoon)(5 g)									
8.	Drinks and beverages-1 big glass Fruit juice (1 glass)(500 ml) Lemon juice (1 glass)(500 ml) Tea/coffee (1 cup)(250 ml) Sharbat/Soft Drink (1 glass)(500 ml)									

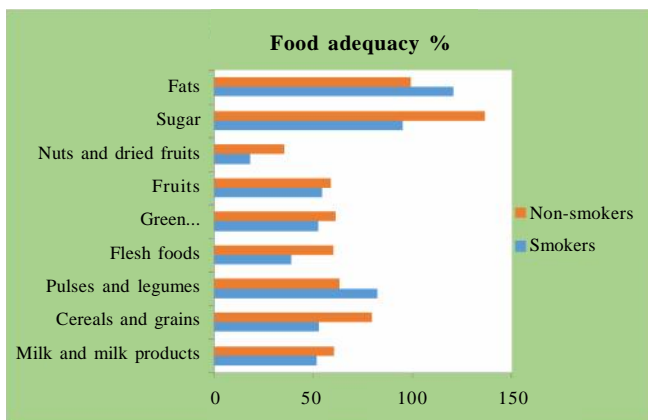
**Appendix 2 : The food craving assessment**

Sr. No.	Food items	Yes/No
1.	Tea	
2.	Meat	
3.	Salty snacks	
4.	Sweet snacks	
5.	Milk/Curd	
6.	Eggs	
7.	Butter/Ghee	

**Table 2 : Food cravings in smokers and non-smokers**

Food items	Smokers	Non-smokers	p-value
Tea	24 (48)	11 (22)	0.006*
Meat	27 (54)	10 (20)	0.0004*
Salty snacks	20 (40)	10(20)	0.020*
Sweet snacks	10 (12)	16 (32)	0.17
Milk/curd	13 (26)	14 (28)	0.81
Eggs	5 (10)	6 (12)	0.74
Butter/Ghee	14 (28)	6(12)	0.045*

\*Significant (P-values calculated using Chi-square test at P<0.05 level of significance)



**Fig. 1 : Food group adequacy per cent**

Smokers were also found to consume significantly less amount of cereals and grains (52.85% Adequacy) than non-smokers (79.57% Adequacy). It was observed that smokers consumed significantly fewer amounts of fruits (18.4 % Adequacy) than non-smokers (35.26 % Adequacy). The smokers were found to be significantly less inclined to sugars (95% Adequacy) than non-smokers (136.4 % Adequacy). On the contrary, smokers consumed significantly more pulses and flesh foods (82.29% Adequacy) than non-smokers (63.2% Adequacy), significantly more oils and fats (120.4% Adequacy) than non-smokers (99.2 % Adequacy)

**Food craving status :**

Food craving status of smokers were obtained by giving them food frequency table after some modifications like addition of salty snacks, sweet snacks, tea and coffee etc (Annexure 2). As expected all the subjects including non-smokers show their cravings for few specific food items. Table 2 depicts the food cravings in all the food groups and it was found that smokers generally have strong urge for 3 food items, that is meat (54%), tea (48%) and salty snacks (40%) while non-smokers have moderate cravings for the given items. The food cravings for tea, meat, salty snacks and butter were found to be highly significant in smokers.

The goal of the current study was to assess the role of food cravings in the management of the Nicotine Induced Anorexia (NIA) and low BMI generally found in smokers using their cravings for certain specific tastes and foods. The study clearly revealed presence of characteristic cravings for different foods in smokers.

The food intake of subjects was assessed and it was found that generally smokers and non-smokers were consuming a deficient diet significantly less from the recommended balanced diet for Indian adult males. The results clearly show that smokers consumed flesh foods and fats more per day. Also smokers were found to have strong urge for generally 3 food items that is meat, tea and salty snacks followed by fatty foods. The result also

clearly depicts the difference between less food consumption due to appetite loss as well as elevated food cravings due to other factors like nicotine use as postulated by Audrain-McGovern and Benowitz (2011).

Interestingly smokers were found to be strongly inclined towards nicotine-caffeine combination as generally all the smokers show an urge of drinking a cup of tea during smoking or *vice versa*. There was a significant interactive effect of caffeine and nicotine on subjective arousal as reported by Rose and Behm (1991) and Kozlowski (1976). In addition smokers particularly had cravings for salty taste while non-smokers have an urge for sweet taste followed by salty taste. It was possibly due to nicotine induced functional and morphological alterations of taste buds in smokers, Pavlidis *et al.* (2009) and Bill (2009).

### Conclusion :

It was concluded that in general, smokers were consuming significantly less diet than non-smokers in terms of RDA except fats and flesh foods mainly due to the appetite loss caused by nicotine induced anorexia due to smoking of tobacco. The food cravings of both the groups were analysed using the food groups table and it was observed that smokers generally have strong urge for 3 food items that is meat, tea and salty snacks while non-smokers have less cravings for the given items. The taste cravings were also analysed and it was observed that smokers are strongly craved for salty taste while non smokers generally had strong urge of sweet taste.

The past researches lack the reliable studies on the problem of anorexia and reduced BMI among current smokers and unfortunately this important issue of progressive anorexia and low BMI in current smokers was not discussed except the weight gain studies on past smokers. Moreover to combat the root cause of anorexia and low BMI in smokers, we proposed the management of the problem right from the smoker's own food and taste cravings. Since cravings are independent of hunger or satiety, therefore subject's loss of hunger was compensated by his cravings or desires for foods.

### Recommendations :

It is recommended to extend the study to the smokers living in different regions and having different food practices especially vegetarian smokers since this study was actually planned for non-vegetarian smokers

of a particular area and their feeding habits are significantly different from those subjects living in other parts of the country where different food habits are prevalent.

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