Research Paper © 2012 IJFANS. All Rights Reserved,

Evaluating the link Between Meal Frequency and the Onset of Type-2 Diabetes: An Impending Study

Manju Dewan

PG Department of Zoology, DAV College, Sector 10, Chandigarh.

manjudewan72@gmail.com

Summary

The composition of meals, portion sizes, and overall dietary patterns can influence the risk of developing type 2 diabetes. The most important prescription for diabetes is diet. In the present study it was observed that those subjects who were taking full meals more than 3 times a day (24.2%) are more prone to this disease. Borderline cases were more in subjects taking 4 times meals daily (37.5%). Newly detected and total diabetic subjects were also more in subjects (37.5%) having frequency of full meal 4 times a day. But known diabetic cases were more in subjects (60.4%) taking 2 times meal daily. Hypoglycemic subjects were also more in subjects having 2 times meal daily

Key words: Meal frequency; glucose; Eating; Food preferences Borderline cases; known diabetic cases Nutritive value; Diet; Diet survey.

INTRODUCTION

Nutritional patterns significantly influence the onset of obesity and type 2 diabetes. Nevertheless, the available evidence regarding the link between dietary frequency and type 2 diabetes has been scant and inconclusive. Our objective was to investigate the correlation between meal frequency and the likelihood of developing type 2 diabetes. Meal patterns and eating habits can contribute to overall health and may affect blood sugar control. But they do not directly cause type 2 diabetes. However, certain meal patterns or dietary habits may increase the risk of developing type 2 diabetes and exacerbate existing risk factors. A diet for diabetes should keep blood glucose from rising too high or dipping too low. Eating too much can cause blood glucose to elevate to unhealthy levels. Conversely, the consequence of glucose levels dropping too low is hypoglycemia, or low blood sugar. This can manifest as nervousness, trembling, weakness, and "brain fog." A healthy diet for diabetic patients is a crucial component to preventing, controlling, and healing diabetes. This article takes a closer look at how food choices impact health for those with diabetes. The aim of this study was to investigate the effect of variation in meal frequency and their combined effect on the response of blood glucose.

METHODOLOGY

The present epidemiological and biochemical study was undertaken in the district Sangrur, Punjab, India. This study was planed to assess frequency of dietary intake using the questionnaire. They were questioned personally, using a questionnaire which is designed

for collection of data and also general information regarding various other epidemiological factors. Participants were asked about meal frequency by the question 'how many meals do you normally eat every day.

RESULTS

On the basis of the frequency of taking meals in a single day, it was observed that those subjects who were taking meals more than 3 times a day (24.2%) were more prone to this disease. Borderline cases were more in subjects taking 4 times meals daily (37.5%). Newly detected and total diabetic subjects were also more in subjects (37.5%) having frequency of meal 4 times a day. But known diabetic cases were more in subjects (60.4%) taking 2 times meal daily. Hypoglycemic subjects were also more in subjects having 2 times meal daily (Table 1) while applying the Chi square test, significant values had been obtained for known ($p<0.02$) and hypoglycemic ($p<0.01$) subjects (Table 2).

DISCUSSION

Borderline and newly detected subjects were more in those having frequency of meals 4 times daily. It can also be indicated by the presence of symptom polyphagia. Due to the detection of disease frequency of diet was reduced to 2 times in known diabetic subjects. Some of them were doing so on the advise of their doctors. Such study regarding the frequency of diet had not been recorded very less.

The earliest studies on effects of food frequency on lipid metabolism, performed on hyperlipidaemic and normal volunteers, indicated that increased meal frequency reduced total cholesterol (Cohn, 1964; Jagannathan *et al*, 1964; Fabry & Tepperman, 1970). A detailed 2-week study showed that if a person nibbles food 17 times a day compared with 0rd the same amount of diet compiled into three meals, there was a reduction of total cholesterol, LDL cholesterol and apoprotein B (Jenkins *et al*, 1989). Another study using liquid-formula diets indicated that decreases in integrated insulin area, serum free fatty acids and serum cholesterol can be seen during the course of a single day with increased food frequency (continuous feeding compared with three equal meals, Wolever, 1990). The literature thus indicates that there are some similarities in the improved carbohydrate and lipid metabolisms associated with increased food frequency, low glycemic-index diets or high dietary fibre intake. Whether the improved metabolic responses share the same mechanisms is not fully understood. Plasma glucose and insulin peaks were lower at the end of the day (Lundin et al, 2004).

The total calorie content of the diet should be appropriate to achieving and maintaining desirable body weight (U.S. Dept. of Health & Human Services, 2000). Several lines of evidence from cross-sectional studies have suggested an inverse association between increased eating frequency and prevalence of obesity (Wang, Zhang and Zhang , 2016). Specifically, there was evidence that four meals per day

compared with three meals per day was associated with a lower prevalence of general and central obesity (Holmback, Ericson and Gullberg, 2010).

Another study also showed an inverse association of meal frequency with the risk of type 2 diabetes incidence. Although a high-quality diet was associated with lower risk of type 2 diabetes (Yu, Zheng and Cai,2018) evidence on association between meal frequency and diet quality was inconsistent

 (Murakami, K & Livingstone, MB ,2016 and Leech, Livingstone and Worsley,2016) Despite the increasing importance of cardiovascular disease and diabetes, awareness of prevention measures and healthy lifestyle have not improved sufficiently among the general population" (Regional plan for integrated control of cardiovascular diseases and diabetes for the Western Pacific Region, 1998–2003) is at best an overgeneralization and at worst untrue. Although educational programmes have increased awareness about healthy diets and nutritional foods, people in the Pacific nonetheless choose to consume less-healthy foods because of cost and availability (i.e. they make economically rational, but nutritionally detrimental, decisions to consume certain foods). Thus, poor diet is not simply a health or health-education issue, it is also economic. American Diabetes Association has defined self-dietary management as the key step in providing the diabetics, the knowledge and skill in relation with treatment, nutritional aspects, medications and complications. A study showed that the dietary knowledge of the targeted group who were at high risk of developing type 2 diabetes was poor (Waqas et al 2017). Consuming larger portions or overeating at meals, as well as frequent snacking on high-calorie, low-nutrient foods, can contribute to weight gain and obesity. Excess body weight is a significant risk factor for type 2 diabetes, as it can lead to insulin resistance and impaired glucose metabolism. Chronic overeating and excessive calorie intake can strain the body's ability to regulate blood sugar levels effectively, increasing the risk of developing diabetes.

Too much of a good thing is bad = Too much food predisposes people to obesity and diabetes. Too little of a good thing is bad = Too little exercise predisposes people to obesity and diabetes (Mike et al, 2001).

Just as people and their life circumstances change, diets change. Changes might occur because of the individual's needs or because of new research. A balance of diet and exercise to maintain a balance of "calories in and calories out" is necessary. The increased flow of goods, people, and ideas associated with globalization has contributed to an increase in non-communicable diseases in much of the world. One response has been to encourage lifestyle changes with educational programmes, thus controlling the lifestyle-related disease. Erratic eating patterns, such as skipping meals, prolonged fasting, or irregular meal timing, can disrupt the body's internal clock (circadian rhythm) and impact metabolic processes, including glucose metabolism and insulin sensitivity. Irregular meal timing may lead to fluctuations in blood sugar levels and make it more challenging to manage diabetes. Consistent meal timing and regularity are important for stabilizing blood sugar levels and supporting overall metabolic health. Diabetes can be controlled through improvement in patient's dietary

knowledge, attitudes, and practices. These factors are considered as an integral part of comprehensive diabetes care (Islam et al 2015).

Thus, the key is to stabilize blood glucose at a healthy level. To keep your blood glucose levels stabilized, the National Diabetes Information Clearinghouse (NDIC) recommends that you:

Eat about the same amount of food each day.

Eat your meals and snacks at about the same times each day.

Do not skip meals or snacks.

REFRENCES

Cohn **C** (1964): Practicability of diet in Diabetes Management. *Fed. Proc.* **23**, 76️81. PubMed

Fabry Pp and Tepperman J (1970): Meal frequency—a possible factor in human pathology. *Am. J. Clin. Nutr.* **25**, 1059️1068.

Holmback, I, Ericson, U, Gullberg, B, et al. (2010) A high eating frequency is associated with an overall healthy lifestyle in middle-aged men and women and reduced likelihood of general and central obesity in men. Br J Nutr 104, 1065–1073.CrossRefGoogle ScholarPubMed

Islam SM, Niessen LW, Seissler J, Ferrari U, Biswas T, Islam A, et al. Diabetes knowledge and glycemic control among patients with Type 2 diabetes in Bangladesh. *Springerplus.* 2015;4:284.

Jagannathan SN, Connel WF and Beveridge JMR (1964): Effects of gormandizing and semicontinuous eating of equicalorie amounts of formula-type high fat diets on plasma cholesterol and triglyceride levels in human volunteer subjects. *Am. J. Clin. Nutr.* 15, 90-93.

Jenkins DJA, Wolever TMS, Nineham R, Sarson DL, Bloom SR, Ahern J, Alberti KGMM and Hockaday TDR (1980d): Improved glucose tolerance four hours after taking guar with glucose *Diabetologia* 19, 21-24.

Leech, RM, Livingstone, KM, Worsley, A, et al. (2016) Meal frequency but not snack frequency is associated with micronutrient intakes and overall diet quality in Australian men and women. J Nutr 146, 2027–2034.

Lundin, E.A.; Zhang,J.X; Lairon, D.; Tidehag, P.; Åman,P.; Adlercreutz ,Hand Hallmans, G. 2004. Effects of meal frequency and high-fibre rye-bread diet on glucose and lipid metabolism and ileal excretion of energy and sterols in ileostomy subjects Journal of Clinical Nutrition *. 58, 1410-1419***.**

Mike Evans, Robert C. Sinclair, Caroline Fusimalohi, & Viliami Liava'a Globalization, diet, and health: an example from Tonga Bull World Health Organ vol.79 no.9 Genebra 2001

Murakami, K & Livingstone, MB (2016) Associations between meal and snack frequency and diet quality in US Adults: National Health and Nutrition Examination Survey 2003–2012. J Acad Nutr Diet 116, 1101–1113.CrossRefGoogle ScholarPubMed

Regional plan for integrated control of cardiovascular diseases and diabetes for the Western Pacific Region, 1998–2003. Manila, World Health Organization Regional Office for the Western Pacific, 1998.

U.S. Dept. of Health & Human Services. *Healthy People2000: National Health Promotion and Disease Prevention Objectives.* Washington, D.C. 1990.

Wang, YQ, Zhang, YQ, Zhang, F, et al. (2016) Increased eating frequency is associated with lower obesity risk, but higher energy intake in adults: a meta-analysis. Int J Environ Res Public Health 13, 603.CrossRefGoogle ScholarPubMed

Waqas Sami,Tahir Ansari,Nadeem Shafique Butt,and Mohd Rashid Ab Hamid . 2017 Effect of diet on type 2 diabetes mellitus: A review Int J Health Sci (Qassim). 2017 Apr-Jun; 11(2): 65–71.

Wolever TMS (1990): Metabolic effects of continuous feeding. *Metabolism* 39, 947-951.

Yu, D, Zheng, W, Cai, H, et al. (2018) Long-term diet quality and risk of type 2 diabetes among urban Chinese adults. Diabetes Care 41, 723–730.

TABLE 1

Relationship between frequency of meals and various categories of diabetes mellitus (N=1000)

Status of subjects		1 (n=18)	2 (n=331)	3 (n=643)	4 (n=8)
Normal (653)	n (%)	15 (83.33)	207 (62.53)	429 (66.71)	2 (25.00)
Borderline (241)	n (%)	2 (11.11)	80 (24.16)	156 (24.26)	3 (37.50)
Newly detected (55)	n (%)	—	15 (4.53)	37 (5.75)	3 (37.50)
Known diabetic (38)	n (%)	—	20 (6.04)	18 (2.79)	—
Hypoglycemic (13)	n (%)	1 (5.55)	9 (2.71)	3 (0.46)	—
Total diabetic (93) ND + K	n (%)	—	35 (10.57)	55 (8.55)	3 (37.50)

ND : Newly detected diabetic subjects, K : Known diabetic subjects.

n : Number of subjects in each groups, N : Total number of subjects.

TABLE 2   STATISTICAL ANALYSIS

Status of subjects	x^2	DF	p	HS/NS/S
Normal	9.875	3	<0.05	S
Borderline	0.095	1	>0.05	NS
Newly detected	1.363	1	>0.05	NS
Known diabtic	5.922	1	<0.02	HS
Hypoglycemic	8.892	1	<0.01	HS

x^2 : Chi Square test, p : Probability, HS : Highly Significant,   NS : Non significant, S: Significant,

DF : Degree of Freedom,