Original article:

Breakfast skipping, late Dinner intake and heavy lunch consumption relationship to glycemic control and neck circumference among patients with type 2 diabetes mellitus

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Abstract:

Introduction: There is an increasing awareness about the daily feed-fasting rhythm and meals timing among patients with diabetes.

Objectives: The current study assessed breakfast skipping, late dinner consumption relation to glycemic control and neck circumference among patients with type 2 diabetes mellitus.

Subjects and Methods: This cross-sectional study conducted among 102 consecutive patients with type 2 diabetes attending a diabetes clinic in Omdurman, Sudan during the period from June to September 2017. A structured questionnaire was used to interview the participants to collect the demographic data, breakfast skipping, and high-calorie consumption in Lunch. The neck circumference was measured to assess central adiposity, and a blood sample was taken for glycated hemoglobin (HbA1c) to determine glycemic control. The Chi-square and t-test were used to compare the categorical and numerical dat and a P-value<0.05 was considered significant.

Results: Out of 102 of participants (70.6% females), their mean age was 59.62±9.91, the mean glycated hemoglobin (10.16±3.14), neck circumference was (34.27±9.26), only 23.5% achieved target HbA1c, breakfast skipping, late dinner intake, and consumption of high calorie at lunch were evident in 27.5%, 43.1%, 41.2% of patients respectively. No significant statistical difference was apparent between patients with habitual breakfast skipping, late dinner intake, and those whose main meal was Lunch and their counterparts regarding HbA1c, neck circumference, diabetes nephropathy, and diabetic retinopathy.

Conclusion: Breakfast skipping, late Dinner intake, and large calorie consumption were not associated with poor glycemic control and high neck circumference.

Keywords: Breakfast skipping, late Dinner, HbA1c, neck circumference, diabetes

1.Introduction:

Diabetes mellitus is approaching a global epidemic; Currently, 285 million are affected by this lifelong morbid metabolic disorder, and the projection for the year 2030 is 438 million. According to International Diabetes Federation, the 7.7% of Sudanese people are affected by this serious health problem on the level is on the reise [1,2]. Lifestyle management is an essential component of diabetes holistic care from the initial evaluation through regular follow-up, assessment for complications and subsequent management. Medical nutrition therapy plays an integral role in the management of a patient with diabetes mellitus, and t should be individualized for every patient. To

prevent and delay the development of microvascular complications. The American Diabetes Association recommend the glycated hemoglobin target of <7. Medical nutrition therapy is associated with 0.5-2% glycated hemoglobin reduction in type 2 diabetes[3,4].

The association of breakfast skipping with diabetes mellitus and adiposity among adults is controversial, with some reported a positive relationship. On the other hands, a recent review indicated that the consumption of whole grains and cereal fiber in breakfast and limiting rapidly available carbohydrates lowers insulinemia and glycemia. Eating late at night regardless of meal composition had been linked to higher cardiovascular disease risk[5,6].

Many factors have been suggested to link type 2 diabetes mellitus and breakfast skipping including decreased appetite, nocturnal activity, sedentary lifestyles, and smoking. Furthermore, the habit of breakfast skipping could be associated with late dinner owing to various factors including fatigue, poor appetite and lack time[7].

The daily rhythm of feeding-fasting and meal timing are emerging as essential health determinants; previous researchers observed that decreased length of overnight fasting or increased late night eating increases the risk of metabolic diseases. The daily eating pattern is a potentially crucial modifiable aspect for the prevention of diabetes mellitus[8]. No researchers have studied breakfast skipping, and late Dinner intake in Sudan and the studies conducted in Western countries and Asia may not apply to Sudan. Thus we did this survey.

Aims and objectives: To assess breakfast skipping, late Dinner intake, and consuming high calorie at Lunch among Sudanese patients with type 2 diabetes and investigate their relationship to glycemic control and neck circumference.

2.Subjects and Methods:

This cross-sectional study conducted at a diabetes clinic randomly chosen from seven clinics in Omdurman, Sudan during the period from June to September 2017. One-hundred-two consecutive patients with the diagnosis of type 2 diabetes (according to American Diabetes Association Guidelines[9] were asked to sign a written informed consent then a face to face interview was carried using a structured questionnaire. The sample size was calculated using the formula: $n=Z^2$ P-Q/d^2 where Z = 95% confidence (1.96), P = Prevalence of diabetes mellitus in Sudan[1]. The following information were collected: Age, sex, occupation, the level of education, time since the diagnosis of diabetes, microvascular and macrovascular complications of diabetes financial issues with drugs, medication side effects, the frequency of skipping the breakfast, consumption of meals in the last two hours before sleeping, and if lunch is the main meal. Neck circumference (NC) was measured as a marker of upper body subcutaneous adipose tissue distribution, a relatively new method of differentiating between normal and abnormal fat distribution. Previous studies have shown that the (NC)>37 cm and 34 cm in men and women respectively are probably the best cutoff points to determine subjects with central obesity[10,11]. Neck circumference was measured below the laryngeal prominence and perpendicular to the long axis of the neck, an elastic tape was used for the measurement, and the minimal circumference is recorded to the nearest 0.1 cm. The patients should look forward and the shoulders not elevated. A blood sample was taken for HbA1c measurement to assess the degree of diabetes control using the reagent from using a glycol hemoglobin reagent set from HB1C Siemens Healthcare Diagnostics Newark, DE 19714, USA. Breakfast was defined as any food or beverages consumed between 5:00 a.m. and 10:00 a.m.[7], those

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who skipped breakfast for at least three days were defined as breakfast skippers, and those who consumed dinner within 2 hours before bedtime at least three times per week were regarded as late dinner consumers[12]

The Statistical Package for Social Sciences (SPSS, Version 20, Chicago) was used for data analysis with a P-value of <0.05 considered significant. The ethical committee of Elnour Center, Omdurman, Sudan approved the research.

3. Observations and Results:

They were 102 patients with type 2 diabetes (70.6% women), mean age (59.62±9.91 years), the majority had a primary education (64.6%), 60.8% were housewives, 17.6% were laborers, 15.7% were employed, while 5.9% were teachers. Good glycemic control was observed in only 23.5% and clinical inertia to insulin in 47.1%. Table 1.

The mean glycated hemoglobin was 10.16±3.14, the average time since diabetes diagnosis was 11.90±8.72 years, and the neck circumference was 34.27±9.26 cm. Table 2.

The current data showed breakfast skipping was evident in 27.5%, late dinner consumption in 43.1%, large calorie consumption in lunch in 41.2%, Diabetes neuropathy was found in 35.3%, diabetes retinopathy in 29.4%, and ischemic heart disease in 3.9%. Table 3.

In the present study, no significant statistical difference was found between breakfast skippers and regular consumers regarding HbA1c (10.37±2.39 vs. 10.08±3.33, P-value=0.771), Neck circumference (36.18±2.48 vs. 33.55±10.37cm, P-value=0.371), diabetes retinopathy (35.7% vs. 24..3%, P-value=0.543), and diabetes neuropathy ((35.7% vs. 24..3%, P-value=0.543). Table 4.

No significant difference was found between late dinner consumers and their counterparts regarding the glycated hemoglobin ((10.62±3.27vs. 9.81±3.3.06, P-value=0.368), Neck circumference (33.98±8.26 vs. 34.50±10.10cm, P-value=0.845), diabetes retinopathy was found in 36.3% and 48.2% of late dinner consumers and non-consumers with no significant statistical difference, P-value=0.371, while diabetes nephropathy was concluded in 45.4% and 41.3% of late dinner consumers and early consumer with no significant statistical difference. Table 5.

The present study showed no significant difference between patients with type 2 diabetes who consume large lunch and others with average meal size neck circumference (34.42±8.63 vs. 34.17±9.83cm, P-value=0.924, and HbA1c (10.43±3.21 vs. 9.98±3.14, P-value=0.618. Table 6 depicted a comparison between heavy lunch consumers and average consumers.

Table 1. Basic characteristics and medications adherence among Sudanese patients with type 2 diabetes mellitus

Character	No%
Sex	
Males	30 (29.4%)
Females	72 (70.6%)
Education	
Illiterate	26 (25.5%)
Primary	30 (29.4%)
Intermediate	10 (9.8%)
High secondary	22 (21.6%)
University	14 (13.8%)
Occupation	
Housewives	62 (60.8%)
Laborer	18 (17.6%)
Employee	16 (15.7%)
Teachers	6 (5.9%)
Good glycemic control	24 (23.5%)

Table 2. Patient's characteristics mean ±SD

Character	Mean ±SD
Age	59.62±9.91
HbA1c%	10.16±3.14
Meantime since diabetes diagnosis	11.90±8.72
Neck circumference (cm)	34.27±9.26

Table 3. Meal pattern and diabetes complications among patients with type 2 diabetes

Character	No%
Breakfast skipping	28 (27.5%)
Late dinner intake	44 (43.1%)
High-calorie consumption in lunch	42 (41.2%)
Neuropathy	36 (35.3%)
Retinopathy	30 (29.4%)
Macrovascular complications	4 (3.9%)

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Table 4. Breakfast skipping relation to the glycated hemoglobin, retinopathy, and neuropathy

Character	Breakfast skippers n=14	Nonskippers n=37	P-value
HbA1c	10.37±2.39	10.08±3.33	0.771
Neck circumference	36.18±2.48	33.55±10.37	0.371
Retinopathy	5 (35.7%)	9 (24.3%)	0.543
Neuropathy	5 (35.7%)	9 (24.3%)	0.969

Table 5. Late dinner consumption related to the glycated hemoglobin, retinopathy, and neuropathy

Character	Late dinner consumption n=22	Normal dinner consumption n=29	P-value
HbA1c	10.62±3.27	9.81±3.3.06	0.368
Neck circumference	33.98±8.26	34.50±10.10	0.845
Retinopathy	8 (36.3%)	14 (48.2%)	0.371
Neuropathy	10 (45.4%)	12(41.3%)	0.186

Table 6. High calorie at lunch n=21 relation to the glycated hemoglobin, retinopathy, and neuropathy

Character	High calorie n=21	Normal calorie n=30	P-value
HbA1c	10.43±3.21	9.98±3.14	0.618
Neck circumference	34.42±8.63	34.17±9.83	0.924
Retinopathy	3 (14.2%)	18 (60.0%)	0.047
Neuropathy	5 (23.8%)	16 (53.3%)	0.151

4. Discussion:

Breakfast skipping is considered to be unhealthy and could predispose to adiposity and type 2 diabetes, in the present study, no significant statistical difference was found between breakfast skippers and consumers regarding glycemic control, neck circumference, and diabetes microvascular complications in similarity to a survey conducted in Japan [13] and found no relation between breakfast skipping and the metabolic syndrome. Another study [14] concluded that skipping a meal does not lead to energy compensation at subsequent meals suggesting that breakfast skipping could be effective for energy reduction. In accordance with the present data, is a randomized control trial[15] which concluded the lack of discernable effect of breakfast eating or skipping on weight loss in free-living adults. Eating late dinner at night could lead to breakfast skipping in the subsequent day[13], in the current study, no significant statistical differences were found between late and early dinner consumption, regarding glycemic control, neck circumference, and microvascular complications in accordance with a study published in South-East Canada [16] and found no association between timing of the evening meal and cardiometabolic profiles. Another research conducted in India[17] and found no relationship between late

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dinner consumption and body mass index. The present data are in contradiction to a previous study published in Japan[13] and found the association between body mass index and late dinner intake.

Previous literature[18] reported the association of breakfast skipping and increased postprandial glucose after lunch, the present study showed no effect on large lunch consumption on glycemic control, neck circumference, retinopathy, and neuropathy, previous studies[19] concluded that meal size and composition led to differences in insulin and incretin responses but not to differences in postprandial glucose levels of the well-controlled patients with diabetes.

The association of meal with body weight, and diabetes mellitus is complicated, a recent randomized controlled crossover trial[20] indicated that meal skipping increased energy expenditure. In contrast, higher postprandial insulin concentration and increased fat oxidation may lead to low-grade inflammation and impaired glucose homeostasis in the long term.

Previous studies reported that the relationship between breakfast skipping and poor glycemic control is partially explained by chronotype[21] (late chronotype was associated with higher HbA1c), the meal composition[22] (high protein breakfast was shown to attenuate postprandial glucose response compared to high carbohydrates), and the combination of breakfast skipping and smoking[23]. Furthermore, the assumption that people eat three meals/day within twelve hours interval may not be correct, a recent camera phone based cohort[24] reported that eating events are spread throughout the day.

5.Conclusion: The present study showed no significant differences between breakfast skippers, late dinner consumers, and heavy lunch consumers and their counterparts regarding glycemic control, neck circumference, and diabetes microvascular complications. The study had many limitations: The small size of the study sample and the research was conducted at a single diabetes clinic, and the reliance on self-reported feeding rhythm, also we did not control for various confounders like meal content, glycemic index, chronotype, smoking, and level of exercise. Further larger multi-center studies addressing these variables are needed.

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