Food Habit and Risk of Pre Diabetes and Type2 Diabetes among the Meiteis of Manipur, India

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Abstract

Background: The eating pattern and types of food consumption are associated with the risk of type 2 diabetes. The present study aims at finding out the association between the types of food consumption and prevalence of type 2 diabetes among the Meiteis of Manipur, India.

Methods: A total of randomly selected 1026 Meitei subjects which include both sexes (25 to 65 yrs.) from Five valley districts of Manipur were tested for fasting blood glucose levels using AccuCheck Active Glucometer. Each and individual was personally interviewed for dietary assessment.

Result: Among the studied population, the most commonly consumed food items for breakfast is deep fry pooris (20.66%), while 46.39% go for an early meal skipping their breakfast though no significant difference is observed between breakfast eaters and non-eaters. Considering the meals, though consumption of mixed white rice was found higher (51.4%) than the consumption of Meitei indigenous white rice (48.6%), the prevalence of pre-diabetic 40.5% and diabetic 16.0% was found significantly higher among the Meitei indigenous white rice eaters.

Conclusion: There is an increased risk of pre-diabetic and diabetic. Therefore, it is recommended that people should eat mixed white rice to reduce the risk of type 2 diabetes.

Keywords: *Breakfast, White rice, Lifestyle, Food habit, Meitei, Diabetes*

Introduction

The most common lifestyle disease is type 2 diabetes mellitus (DM), which is multifactorial that results to malfunctioning of many organs in man. Diabetes Mellitus is defined as a metabolic syndrome characterized by chronic hyper glycemia due to disturbances of fats, carbohydrate, and protein metabolism that are associated with absolute or relative deficiencies in insulin secretion, insulin action, or both[1]. Western dietary pattern is characterized by increased consumption of red meat, processed meat, French fries, high-fat dairy products, refined grains, and sweets and desserts. These patterns are associated with T2D risk[2]. The proportion of people who reported regularly consuming breakfast has been decreasing over the past decades among children, adolescents and adults as many of them started skipping breakfast[3,4]. In a recent cross-sectional study among the US adults, consumption of ready-to-eat cereal breakfast was associated with a better cardio metabolic risk profile than was with the consumption of other types of breakfast[5]. A study reported that skipping breakfast is associated with obesity and an increased risk of type 2 diabetes[6].

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Risk of Type 2 Diabetes:

There are several risk factors triggering type 2

diabetes, both genetic and environmental factors like physical activity, obesity status, dietary habit, age, alcohol consumption and smoking etc. In today's world diet plays a vital role in causing type 2 diabetes. An unbalanced dietary habit with readily available prepared food or pack food leads to physically inactiveness and overweight.

Diet is a significant risk factor for diabetes. Diet, consisting of higher and inadequate fat intake, higher carbohydrate, but lower protein intake promotes the onset and increases the susceptibility to diabetes, cardiovascular disease, and other associated diseases. Higher dietary fat intake is associated with insulin resistance and obesity. Reduced fibre consumption and an increase in the consumption of refined carbohydrates are associated with an increased risk of developing T2D[7]. A prospective study found that regular consumption of white rice is associated with an increased risk of T2DM, whereas replacement of white rice by brown rice or other whole grains is associated with a lower risk[8].

Rice is widely cultivated and consumed especially by the Asian population. Rice which is now grown worldwide, provides food for more than half of the world's population, particularly those living in some of the most populous countries, such as India, China, and Japan. Higher consumption of white rice is significantly associated with increased risk of type 2 diabetes, particularly in Asian (Chinese and Japanese) populations[9,10,11]. A significant positive relation between white rice consumption and risk of diabetes was observed among two cohorts of Chinese and Japanese women[10,11]. White rice is the highest contributor to dietary glycaemic load for all the populations that consume rice as a staple food[10,11].

Furthermore, white rice has a higher glycemic index (GI) compared to brown rice and other whole grains[12]. Starchy foods such as boiled white potatoes, French fries, and white rice are high in glycemic index[13]. High glycemic Index diets have been observed to have co-relation with an elevated risk of T2DM in several prospective cohort studies[11,14]. The Middle East is estimated to have the highest relative increase in the prevalence of T2DM by 2030[15]. Rice has low in fibre and has a high glycemic index, meaning it can increase blood sugar levels very rapidly[16].

Based on the findings of the earlier researchers who had worked on different parts of the globe, it is reported that food habit more particular types of food consumed has a correlation with the incidence of T2DM. Steered by these findings, the present study aims at examining if there is any correlation between the types of food consumed and type 2 diabetes among the Meiteis of Manipur.

The Meiteis who are the subjects of the present study is the dominant caste group found distributed in 5 (five) valley districts of Manipur - one of the small states of the North-Eastern Indian Union situated on the Indian-Myanmar border. Considering what the various writers said about the possible origin of the Meiteis of Manipur, the researchers traced the origin of the Meiteis to have a connection with Aryan, Mon Kmer and Tai, Tibeto-Burman and Naga-Kuki[17.18].

The staple food of Meitei is white rice; they consume it at least twice a day as a practice. The Meitei people do not have the habit of eating heavy breakfast; they therefore solely depend on white rice in the form of meals for their daily consumption.

Since there is high consumption of white rice among the Meitei people, the present study hypothesized that there must be a high prevalence of pre-diabetic and type 2 diabetes among the Meitei of Manipur.

The Meiteis of Manipur consumes different types of food. Irrespective of different districts, they have common food consumption; those people who used to eat regular breakfast prefer to have deep fry poori, bread, biscuit, milk, etc. The Meiteis distributed in different districts of Manipur have the same food habit. Unlike mainland India and Western countries, people of Manipur don't have the habit of consuming heavy breakfast which can last till afternoon. With the quantity of food consumed, the risk of different lifestyle diseases also differs. White rice is a food that cannot be replaced by any other food among the Meiteis of Manipur.

Most of the Meitei people of Manipur consume mixed rice (local Manipuri indigenous white rice mixed with imported rice from other states popularly known as superfine rice. There are quite a number of local varieties of white rice with a different local name but with a common name '*Chak athotpa'* meaning soft rice widely

cultivated all over the valleys and hills of Manipur. This indigenous white rice has high starch content and aromatic flavour. They are tastier and costlier than the non-sticky white rice. On the other hand, the non-sticky white rice commonly known as superfine rice (mostly imported) they are rarely cultivated in the Valleys of Manipur. These white rice can be of two varieties, sticky white rice with high starch content and non-sticky white rice with very low starch content. All the types of superfine white rice are mostly imported from outside (other states of India) and are non-sticky and contain little starch. Therefore, in the present study, the consumption of different kinds of white rice is carefully examined and recorded during the data collection. The Meiteis of Manipur, eat three different varieties of white rice, i.e. either only *Chak Athotpa*, or only superfine rice or both mixed. But in general, most of them consume either *Chak Athotpa* or mixed white rice. Therefore, in the present study, subjects belonging to these two categories are considered.

Materials and Methods

In this present study altogether, 1026 participants comprising of 517 males and 509 females, age ranging between 25 to 65 years representing the five valley districts viz. Imphal East, Imphal West, Thoubal, Kakching and Bishnupur districts (table 1) were recruited by using multi-stage random sampling technique.

The fasting blood glucose level was recorded with the help of Accu Check Active Glucometer for all the participants. A set of close-ended structured questions relating to their dietary habits such as food items for breakfast, types of white rice consumed and frequency of consumption were administered to them. Meiteis do not have the habit of having heavy breakfast, but mainly depend on rice consumption. All the participants in the present study consume rice twice a day, one at morning as morning meal and second at night as dinner. None of the participants skipped rice consumption for a day or either of the meal. None of them substitutes rice with either roti, chappati or any other food item. None of them replaces white rice with black rice. Hence, the study was conducted purely only on white rice consumption and breakfast items among the Meiteis of Manipur. Since the present work is based on qualitative data, chi-square goodness of fit has been applied to check if there is any significant difference.

Table 1: District wise Distribution of Sample

Population	Imphal East	Imphal West	Thoubal	Kakching	Bishnupur	Total
Male	98	100	103	107	109	517
Female	109	100	98	99	103	509
Total	207 (20.18%)	200 (19.50%)	201 (19.60%)	206 (20.08%)	212 (20.66%)	1026

Source: Authors data Survey period-2019

Results and Discussion

The most common food items eaten by the Meiteis of Manipur at the time of morning breakfast are deep fry roti or poori, bread, biscuit, plain milk, and tea. Only a few families among the studied population eat fruits, eggs, noodles, etc. Some of the subjects eat mixed food item; hence they were over-counted, resulting in 1051 persons instead of the actual sample size of 1026, (table 2). The type of food pattern was noted after an in-depth interview and cross-questioning the regularity.

Table 2: Food Items Consumed at Breakfast time

Type of Food	Frequency	Percentage
Deep fry Poori	212	20.17
Bread	155	14.75
Biscuit	109	10.36
Not Specified (mixed)	44	4.19
Milk	27	2.57
Fruits	22	2.09
Bread + Egg	6	0.58
Skipped	476	45.29
Total	1051	100

Source: Authors data Survey Period-2019

Among the studied population, irrespective of age and sex, the most commonly consumed food item of breakfast is deep fry poori (20.17%) combined with some vegetables stir fry or gravy food. It is readily available in most of the tea stalls and hotels elsewhere in the localities and market. They are also tasty that blends a perfect combination. Hence, people prefer to consume it more than any other menu. The high incidence of Pre Diabetic individuals was found among those who eat deep fry poori (38.68%) in their breakfast as compared to other food items. There is a high incidence of Type 2 Diabetes among those people who take milk (29.62%) regularly. Though there is variation in the rate of Pre Diabetic and Type 2 Diabetes with different food item consumed in breakfast, it does not show any statistically significant difference ($\chi2=10.625$, df= 14, $p<0.122$, table 3). Therefore, different food items consumed as breakfast does not play a vital role in developing Type 2 Diabetes among the Meiteis of Manipur. At the same time, though the findings of the present work reveal some difference in the frequency percent distribution among the participants who are regular breakfast eater and those who skipped their breakfast, there is no statistically significant difference in the prevalence of diabetes, ($\chi2=2.6723$, df= 8, $p< 0.262$, table 4). The main reason for this finding may be that people of Manipur do not eat heavy breakfast like those in mainland India and other countries. Consuming two slice of bread or two pieces of fried poori daily does not have any impact for resulting in the incidence of diabetes, unlike those in other places, countries, where they consume heavy breakfast, which includes bread, butter, milk, egg, sausage, etc. at one time.

Table 3: Type of Food and Incidence of Pre-diabetes and Type 2 Diabetes among the Meiteis of Manipur Valley

Food item	Blood Glucose levels						Total	
	Normal		Pre-diabetes		Diabetes			
	f	%	f	%	f	%	f	%
Deep fry Poori	103	48.58	82	38.68	27	12.74	212	100
Bread	75	48.39	52	33.55	28	18.06	155	100
Biscuit	65	59.63	32	29.36	12	11.01	109	100
Not Specified	20	45.45	13	29.55	11	25.00	44	100
Milk	11	40.74	8	29.63	8	29.62	27	100
Fruits	9	40.9	11	50.1	2	9.0	22	100
Bread + Egg	6	100	0	0	0	0	6	100
Skipped	259	54.41	163	34.24	54	11.35	476	100
Total	548		361		142		1051	

$\chi 2=10.625$, df= 14, $p<0.122$ (Survey period- 2019)

Table 4: Prevalence of Pre Diabetes and Diabetes among Breakfast Eater and Skipper Meiteis of Manipur Valley

Consumption Pattern	Blood Glucose levels						Total	
	Normal		Pre-diabetic		Diabetic			
	f	%	f	%	f	%	f	%
Eat Breakfast (53.60%)	277	50.37	194	35.27	79	14.36	550	100
Skipped (476%)	259	54.42	163	34.24	54	11.34	476	100
Total	536 (52.34%)		357 (34.80%)		133 (12.96%)		1026	

$\chi 2=2.6723$, df= 8, $p< 0.262$ (Survey period- 2019)

The eating pattern and types of food consumption are associated with the risk of Type 2 Diabetes. Rice is widely cultivated all over Manipur and all over Asia. White rice being the staple food of Meiteis, all the Meitei people of Manipur consume white rice. Despite that they also consume white rice of different varieties having different flavours. These include white rice landrace cultivated or as well as imported from other states.

A significant positive association between white rice consumption and risk of diabetes was observed among two cohorts of Chinese and Japanese women[10,11]. White rice is the primary contributor to dietary glycaemic load for populations that consume rice as a staple food[10,11]. Higher consumption of white rice is associated with a significantly increased risk of type 2 diabetes, especially in Asian (Chinese and Japanese) populations[9,10,11].

White rice being the staple food of Meiteis all the Meitei population of Manipur valley consume white rice, despite that they also consume different varieties and flavours of white rice, these include white landrace rice as well as imported from other states. Among the studied population of 1026 participants, 51.4% consume mixed white rice, while 48.6% consume only Meitei indigenous white rice. Though the consumption of mixed white rice was found higher, the prevalence of pre-diabetic 40.5% and diabetic 16.0% was found significantly higher among the people who consume only Meitei indigenous white rice than

Table 5: Type of Rice Consumption and Risk of Pre Diabetic and Type 2 Diabetes among the Meiteis of Manipur Valley

Type of Rice	Blood Glucose levels						Total	
	Normal		Pre diabetic		Diabetic			
	f	%	f	%	f	%	f	%
Meitei white rice (51.4%)	217	43.5	202	40.5	80	16.0	499	100
Mixed (48.6%)	319	60.5	155	29.4	53	10.1	527	100
Total	536 (52.34%)		357 (34.80%)		133 (12.96%)		1026	

$\chi 2=30.338$, df= 2, $p< 0.000$ (Survey period- 2019)

their counterparts (pre-diabetic 29.4% and diabetic 10.1%) thus revealing a statistically significant difference ($\chi 2=30.338$, df= 2, $p< 0.000$, table 5). Diet is a significant risk factor for diabetes. Diet, consisting of higher and inadequate fat intake, higher carbohydrate, but lower protein intake promotes the onset of diabetes. It increases the susceptibility to diabetes such as cardiovascular disease, Type 2 Diabetes, Hypertension and other associated disorders.

As Revealed from these findings, there is increased risk of developing both pre diabetes and type 2 diabetes among those who consumed only Meitei indigenous white rice. The given figure (fig. 1) clearly indicated that pre diabetic and type 2 diabetes upswing for the category who consumed only Meitei indigenous white rice. The present work has also shown a statistically significant increase in risk of pre diabetic and diabetic. The figure also shows that those who consume mixed white rice (sticky and non-sticky) are more in number than those who consume only Meitei indigenous white rice. But the risk of pre diabetic and diabetic is observed higher among those who consume only Meitei Cheng.

Summary

The people of Manipur, irrespective of urban or rural residing, they do not have the habit of taking

regular breakfast. Most of them prefer for early meals for a day instead of taking breakfast. Out of the total of 1026 subjects, 46.39% skipped their breakfast and go for an early meal. The main reason why most of the Meiteis of Manipur skipped their breakfast is that, from the early days and till today, rice is the staple food, and eating a heavy early morning meal is the common practice. The present study shows that there is an increase in risk on both pre-diabetic and type 2 diabetes among those who consumed only Meitei indigenous white rice or *Chak Athotpa.* It is observed that pre-diabetic and Type 2 diabetes upswing for the category who consumed only Meitei indigenous white rice. The present study has therefore shown a statistically significant increase in the risk of pre-diabetic and diabetic among those who consume Meitei indigenous white rice than those who consume mixed white rice even though those who consume mixed white rice (sticky and non-sticky) are more in number than those who consume only Meitei indigenous white rice or *Chak Athotpa.* Many earlier studies have also revealed that white rice consumption has the higher risk of getting pre-diabetic and diabetic. However, replacing of white rice consumption by black rice or other non-sticky white rice is practically not possible for Meitei population as they have been adapted to their cultural practice of eating indigenous white rice. So it is highly recommended to consume mixed white rice (that is blending of two different varieties of rice sticky rice and non-sticky rice) for avoiding the risk of getting pre-diabetic and diabetes.

Conclusion

Type 2 diabetes is a lifestyle disease which can be easily triggered by unconcerned routine and habit of the people. Keeping aside genetic factors it can be led by different environmental factors like sedentary lifestyle, types of food habit, etc. Based on the findings of the present study, it can be concluded that there is no significant relationship between those who consume regular breakfast, and those who skipped breakfast among the Meiteis of Manipur valleys far as type 2 diabetes is concerned. In Manipur, since there is no habit of consuming substantial breakfast, the present work could not find any significant difference among those who eat different breakfast food items. Even if there are some differences in frequency percent of consumption of various food items like deep fry poori, bread, biscuit, etc. among the Meiteis of Manipur Valley concerning type 2 diabetes, they are statistically insignificant. As regards the consumption of Mixed white rice and Meitei indigenous white rice and its association with type 2 diabetes in the said population, it is observed that there is a higher risk of getting pre-diabetic and diabetic among those who consume Meitei indigenous white rice than those mixed white rice eaters even though the numbers of mixed white rice eaters are more than the Meitei indigenous rice eaters.

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