

# **ASSESSMENT OF DIFFERENT COMMERCIALLY AVAILABLE BREADS AND ITS EFFECT ON BLOOD GLUCOSE LEVELS OF HEALTHY INDIVIDUALS.**

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## **ABSTRACT**

### **Background**

Bread is one of the most commonly used breakfast food in India . The consumption also increased tremendously among children and adolescents as well as to some extent among adults. It was found that white bread raises the blood glucose levels and is not considered to be a healthy breakfast option especially for those with diabetes mellitus and those at risk of increased or borderline glucose intolerance.

### **Aim**

To assess different commercially available bread and its effect on Blood Glucose Levels of Healthy Individuals.

### **Study Design**

5 bread varieties were chosen (namely White, Brown, Multigrain, Oats and Tutty fruity bread). The samples were fed to 30 subjects and their effect on blood glucose was analysed.

### **Place of study.**

The study was conducted in BMN College of Home Science, Matunga, Mumbai, India.

## Methodology

A pilot study was conducted on 30 samples to assess the Blood Glucose Levels of each type of bread. The subjects were then given bread-butter and the blood glucose response was re-tested at gap of 1 hour and 2 hour respectively. Each subject was given 5 different varieties of bread for 5 consecutive days i.e. White bread, Brown bread, Multigrain bread, Tutty Fruity bread and Oats bread. White bread is a universal standard, was used as a standard in the study. The average plasma glucose levels were analysed in the study.

**Results:** The average plasma glucose spike of the standard (White bread) was found to be the highest i.e (131.63 mg/dl). It was observed that oats bread was found to have the lowest spike post 1 hour (103.43mg/dl) while tutty fruity bread exhibited a very high blood glucose response (123.90mg/dl) following the standard white bread.

**Conclusion:** Investigations proved that oats bread should be consumed by people to mitigate metabolic syndrome due to a stressful lifestyle. Also, a healthy diet and exercise regime to be followed by subjects in the study.

**Keywords-** Bread, Blood Glucose Levels, baseline value, significance, postprandial glucose.

## 1. Introduction

The modern lifestyle has a number of advantages which include easing people's life, saving hundreds of people's life using newly developed medication and vaccines. On the other hand, modern lifestyle also has several negative effects on health- physically, psychologically and socially. One of these modern ways of living includes the consumption of fast foods. This is due to a fast lifestyle, short specified time for eating and choosing unhealthy foods. Machines have known to save a lot of time but it adversely affects physical health. Modern lifestyle increases the risk of obesity, consequently leading to an increased risk of metabolic syndrome. Diet and physical activity are one of the most important factors that contribute to the risk of various life-threatening diseases. Earlier, most people would rely more on the consumption of fruits and vegetables, thereby adding more nutritive value to the meal while the reduced risk of various diseases. (www.ukessays.com)

Bread is one of the most consumed breakfast items in India. Therefore, bread was used as a part of the study. There are various types of bread in the market that have been chosen as counterparts in the study. Bread are generally made up of wheat flour from which the bran

and germ layers are generally removed in order to increase the shelf life of the product. In order to achieve an increased shelf life the bread invariably undergo various processing procedures like milling and grinding to produce a light coloured flour. Bread is a high carbohydrate based food which means that it generates a very high spike in the blood glucose levels since it is highly processed. (www.breadculture.org)

After a decade study by (Pearson, 2003), it was found that white bread raises the blood glucose levels and is not considered to be a healthy breakfast option especially for those with diabetes mellitus and those at risk of increased or borderline glucose intolerance. Therefore, various other healthier cereal based bread alternatives were produced in the market. This included whole wheat bread, buns, brown bread, rye bread, cornbread, pita, breadsticks, gluten-free, multigrain, ragi bread etc. to name a few. Strategies to optimize blood glucose and insulin responses of bread consumption include replacement of wheat flour with flour types that are rich in dietary fibre such as barley flour. Few of these bread have shown comparatively lower insulin response like multigrain bread, rye bread etc. with double the magnesium content as compared to white bread. While sweet buns and fruit bread increase blood glucose levels as compared to the rise in sugar levels produced by white bread.

## **2. Materials and Methods:**

**2.1 Subject selection:** A pilot study was conducted on 30 samples to assess the Blood Glucose Levels of each type of bread. Subjects were selected by random sampling method aged 20-25 years.

**2.2 Sample preparation:** Fasting Blood glucose of 30 subjects was analysed. The subjects were then given bread (40g) –butter (10g) and the blood glucose response was re-tested at gap of 1 hour and 2 hour respectively. Each subject was given 5 different varieties of bread for 5 consecutive days i.e. White bread, Brown bread, Multigrain bread, Tutty Fruity bread and Oats bread. The average plasma glucose levels were analysed in the study. The average changes in plasma glucose levels over 120 minutes following the consumption of bread was presented.

## **2.3 Analytical methods**

The fasting blood glucose levels were recorded by using a glucometer (Dr Morepen's Glucometer BG 03).

## 2.4 Statistical Analysis.

The results of all tests were analysed by comparing the average values using Anova tables.

## 3. RESULTS

Table1: Blood glucose- fasting, post 1 hour, post 2 hour

| Sr. No | TYPES OF BREADS | fasting Blood Glucose levels (mg/dl) | 1hr Blood Glucose levels (mg/dl) | 2hr Blood Glucose levels (mg/dl) | P value |
|--------|-----------------|--------------------------------------|----------------------------------|----------------------------------|---------|
| 1      | White           | 91.20                                | 131.63                           | 99.80                            | 0.00    |
| 2      | Brown           | 93.19                                | 117.23                           | 98.84                            | 0.00    |
| 3      | Multigrain      | 91.87                                | 120.90                           | 99.70                            | 0.35    |
| 4      | Tutty fruity    | 91.87                                | 23.90                            | 99.70                            | 0.35    |
| 5      | Oats            | 93.33                                | 103.43                           | 99.92                            | 0.01    |

Figure 1: Blood glucose- fasting, post 1 hour, post 2 hour

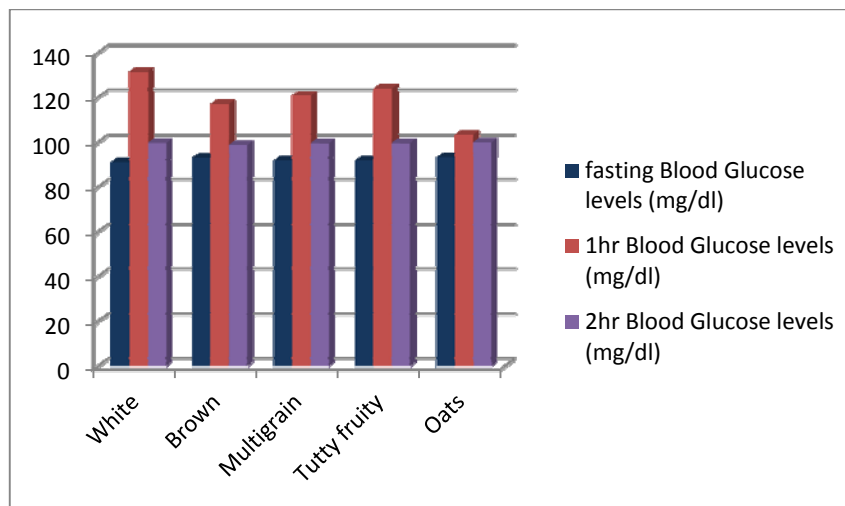


Table 1 describes the mean blood glucose levels of the five test breads –fasting, post 1 hour and post 2 hours. The mean fasting blood glucose for 5 consecutive days showed similar trend **i.e.** increase in the first hour and a gradual decrease in 2<sup>nd</sup> hour. The above-mentioned table showed that white bread had the highest mean glucose response (131.63 mg/dl), after one hour and further declined to 99.80mg/dl in the next hour. Tutty Fruity Bread showed the mean glucose response of 123.90 mg/dl post 1 **hour** with a reduction in blood glucose response to 99.70 mg/dl. Similar results were seen in subjects who consumed multigrain breads but with reduction in blood glucose response by 3 mg/dl (**i.e.** 120.90mg/dl) post 1 hour. The fasting and postprandial blood glucose response were found to be the same for both multigrain and tutty fruity breads. Contrary to these findings, the mean glucose response for oats bread was observed to be the least. **i.e.** (103.43 mg/dl in 1<sup>st</sup> hour) amongst all other bread types, while brown bread showed a moderate increase in blood glucose levels of 117.23 mg/dl in the study.

When fasting, 1 hour and postprandial blood glucose levels of Whitebread were compared with each other, a maximum significant difference was observed statistically in response to blood glucose level at  $P < 0.05$ .

The glycemic index (GI) is a system of classification in which the glycemic responses of foods are indexed against a standard (white bread) since GI conductive in a majority of cases comes out to be 97 that is well approximated to 100. Therefore, concluded white bread should be used as a standard. (Brighenti, 1990)

When fasting, one hour and postprandial blood glucose levels of brown bread were compared with each other, the result showed a significant difference in response to blood glucose levels at  $P < 0.05$

A similar study was conducted by (Venn, 2014) on glycemic differences between white and brown bread on 20 adults. Blood glucose responses were measured at different intervals of two hours each. Results showed that there was a considerable difference between the GI values of both white and brown bread.

When fasting, one hour and post-prandial blood glucose levels of multigrain bread were compared, the result showed a spike in peak of Blood Glucose Levels, which signifies a significant difference in response of Blood Glucose Levels at  $P > 0.05$  after consuming multigrain bread statistically.

A study was conducted by (Kaur, 2015) on 11 Chinese men; it was found out that men who consumed low GI multigrain bread, had lower glyceemic excursions and reduced food intake in healthy individuals.

When fasting, 1 hour and post-prandial blood glucose levels of tutty fruity bread were compared with each other, the result showed no significant difference in response to blood glucose levels at  $P > 0.05$ .

A study conducted by (Wallace, 2007) showed that with equal amounts of carbohydrate available in both types of bread, the GI of tutty fruity bread (80+/- 34) was considerably higher than white bread (84+/- 21) in the study.

When fasting, 1 hour and post-prandial blood glucose levels of oats bread were compared with each other, the result showed a significant difference in response to blood glucose levels at  $P < 0.05$ .

A study conducted showed that Oats bread has the lowest glyceemic response as compared to all other bread types. (Rechenmacher, 2018) conducted a study on various types of bread (white, whole wheat, pumpernickel, rye, oats etc.) and noted their respective glyceemic responses. It was observed that among all the bread, oats bread had the lowest peak blood glucose values.

Figure 1 depicts the fasting, post 1 hour and post 2-hour results of mean blood glucose responses of the 5 commercially available breads. The graph represents the highest mean glucose response at 1 hour for white bread while the lowest response post one hour was observed for oats bread. An exceptionally high blood glucose response for tutty fruity bread was observed when compared with all other types of bread. This was due to the inclusion of

tutty fruity pieces present in bread which are made of highly gelatinized sugar, which directly plays a significant role in increasing the blood glucose responses. On the other hand, similarly high glucose response for multigrain bread might have contributed to the high amount of sugar added to breads in order to neutralize the taste of multigrain cereals.

A similar study conducted by (Pick, 1996) showed that oat bran concentrate bread products improved glycaemic, insulinemic, and lipidemic responses. Another similar finding was observed in 2001, showed that the highest mean glucose value was produced by coarse white bread which was significantly higher than mean glucose AUC values for fruit bread ( $P < 0.01$ ).

#### **4. DISCUSSION**

For the study, 5 varieties of bread which are widely consumed were selected namely White, Brown, Multigrain, Tutty fruity and Oats bread. These bread (in combination with butter) were consumed by 30 subjects on each consecutive day under pilot study in order to evaluate the GL of bread post-consumption. GI and GL of each preparation were calculated using statistical formula. The study was conducted on 30 healthy individuals between the age group of 20-25 years. The participants were given the 5 types of recipes which were prepared (one preparation each day). And their fasting blood glucose (FBS), and blood glucose after one hour and two hours were recorded respectively.

The results revealed that the fasting blood glucose levels (FBS) and post-prandial (PP) blood glucose levels of all the 5 preparations with different varieties of bread were similar. Although there was a spike in the blood glucose levels post 1 hour for all the 5 preparations (white, brown, multigrain, tutty fruity and oats bread), it was observed that oats bread was found to have the lowest spike post 1 hour (103.43mg/dl) while tutty fruity bread exhibited a very high blood glucose response (123.90mg/dl). This was due to the inclusion of tutty fruity pieces present in bread which are made of highly gelatinized sugar, which directly plays a significant role in increasing the blood glucose responses. White bread was observed to have the highest mean blood glucose response (131.63 mg/dl).

## 5. CONCLUSION

Investigations proved that oats bread should be consumed by people to mitigate metabolic syndrome due to a stressful lifestyle. Also a healthy diet and exercise regime to be followed by subjects in the study.

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