

Original Research Article

## **Study on breakfast skipping behavior and possible implication of newly formulated ready to eat snack bar as breakfast food in different populations of Sabaragamuwa University of Sri Lanka**

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**Abstract:** It is very important to have a healthy and nutritious breakfast in order to recover the glycogen stores used up during long overnight fasting period. However, the busy life has forced people to devote less time for healthy breakfast. As such, the Investigation of breakfast consumption patterns of different categories of the population and finding novel convenient breakfast foods is timely requirement. Hence the present study was conducted to investigate the breakfast consumption patterns of undergraduates and working crowd of Sabaragamuwa University of Sri Lanka and to formulate suitable breakfast food for the same population. The breakfast consumption pattern was investigated by a questionnaire survey. The results of the survey revealed that, breakfast is one of the most skipped meals due to the busy lifestyle especially among the females. As a solution to this, more than 90 % of the population was willing to accept a ready to eat snack type bar for breakfast. Thus, based on the questionnaire survey results, a ready to eat snack bar was developed. The nutrient profile of a 100 g portion of the prepared snack bar was, Energy 471kcal, carbohydrates 78g, proteins 1.56±0.05g, fiber 1.78g fat 6.71±0.03g and moisture: 12.66±0.21. An 80 g portion of the snack bar contains 377kcal of energy. 80 g portion size fulfils about 80% of energy required for breakfast of a woman and 120 g of the bar fulfills the same for a man in the studied population. Hence the formulated bar can be recommended as a breakfast snack for adults with a busy lifestyle.

**Keywords:** Breakfast, Novel food, Snack.

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### **INTRODUCTION**

Breakfast is believed to be the most important meal of the day. It is defined as “first meal of the day, eaten before or at the start of daily activities, within 2 h of waking, typically no later than 10:00 a.m., and of an energy level between 20 and 35% of total daily energy needs” by Timlin and Pereira [1], Breakfast provides adequate fuel to start a new day and it helps towards an improved concentration, performance, adding strength and endurance throughout the day [2]. Consuming breakfast can also contribute in maintaining a healthy body mass index (BMI). Breakfast consumption is related with positive outcomes for diet quality, micronutrient intake, weight status and lifestyle factors [3]. Studies reveal that eating breakfast has declined over the past several decades and there is an inversely proportional relationship with breakfast consumption and weight control and related chronic diseases [1]. After a longer overnight fasting period due to sleep the glycogen stores in the body can deplete [4]. In order to recover and replenish the glycogen stores, it is very

important to eat a healthy, nutritious breakfast to ensure a continuous supply of glucose and other nutrients. Therefore breakfast plays a vital role in human diet.

Mellentin [5] reports that “Breakfast has become one of the most fought-over battlegrounds in food and health, a battle fuelled by consumers’ need for easy and quick meals in the morning. Even though there is evidence that breakfast is a very important meal, in the modern society people are in a tug of war between time and work. This has forced them to devote less time for healthy meals. A combination of poor nutrition and high stress due to a busy working life can make a tired and unhealthy person. This can, in turn, affect ones career. A person who fails to take in enough energy and nutrients will become tired, apathetic and suffer from a lack of concentration. These effects will only increase the stress. A poor diet may also lead to a weaker immune system [6]. Most of the people are under medications for many non-communicable diseases such as type 11 diabetes and cardiovascular diseases. Many

of these diseases and health issues in the present society are diet related because people have less time for meal preparations. Skipping meals is a very common habit especially among school children, undergraduates and working crowd. Investigation of breakfast consumption patterns and finding possible solutions for any problem in breakfast consumption of such population is a timely requirement. Hence the present study was conducted to investigate the breakfast consumption patterns of undergraduates and working crowd of Sabaragamuwa University of Sri Lanka and to formulate suitable breakfast food for the same population.

## MATERIALS AND METHODOLOGY

### Breakfast Consumption Pattern

The breakfast consumption patterns of two different categories namely; undergraduates and working population of Sabaragamuwa University of Sri Lanka was investigated. Both males and females from each category were chosen for a questionnaire survey. A total of 217 adults, with 107 undergraduates and 110 from working population participated in this survey. Both types of people selected in the study experience a busy morning. Questionnaire containing 15 breakfast related questions were distributed among this population and data were obtained. Then those data were analyzed using MINITAB 17 Statistical Software.

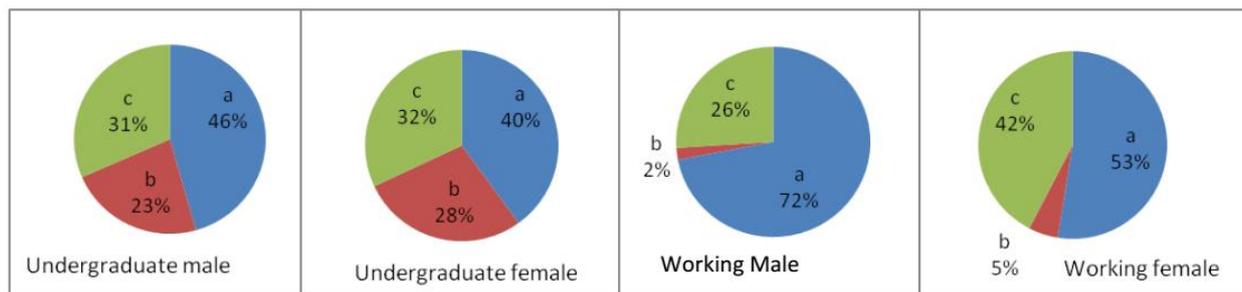
### Development of the RTE meal

Development of the ready to eat snack bar based on the questionnaire survey results was carried out. Firstly the ingredients were selected to represent a balanced diet. The energy value of each selected ingredients were calculated and weights of each ingredient used for the product development were decided according to the calculated energy values to meet the required energy level. Trial sessions were performed with golden syrup and SCM (Sweetend Condensed Milk) separately to select a suitable binding agent. SCM was found to be the most suitable binding agent. Thereby using SCM as the binding agent and the other selected ingredients the product was formulated. The final selected ingredients and amounts of ingredients were Rice flakes: 150 g SCM: 200 g Raisins: 50 g Dates: 40 g Cornflakes: 20 g Preserved papaya: 20 g Green gram: 20 g Butter: 20 g Desiccated coconut: 20 g Sugar: 25 g Semolina: 20g. In the product preparation butter, sugar and SCM were heated and the selected ingredients were mixed with heated mixture. Then the mixed ingredients were put on a baking tray and it was baked for 20-30 minutes at 150°C. Three different RTE snack bars were prepared using the above procedure where the soaking conditions

of rice flakes were varied. Those were 0% soaked, 50% soaked and 100% soaked. These three samples were then subjected to sensory evaluation by a panel of 36 panelists. Thereby the most preferred product was selected using statistical analysis by using minitab-17 software. Kruskalwallis test was used to analyze the data. Then the physicochemical properties of the selected product were investigated using standard methods. Moisture content was determined by the oven dried method, ash content using the dry ash method 923.03 of AOAC (1995), fat content was determined using the soxhlet method, protein content by the kjeldahl method 920.87 AOAC (2000), crude fibre content using chemical digestion method and the carbohydrate level was calculated using the above data. Safety of the product was investigated by total plate count test which was performed using nutrient agar medium and spread plate method. Shelf life of the product was also tested for two weeks in refrigerated conditions.

## RESULTS AND DISCUSSION

One main objective of the study was to investigate the breakfast consumption pattern of the selected population. The results, when analyzed as males and females separately, revealed that around 60 % of males tend to consume breakfast daily whereas only 41 % of females did so. The rest of them either skip breakfast or consume sometimes in an irregular pattern. In females around 15 % skips breakfast and majority (around 43 %) consumed breakfast only sometimes. The data was collected from two different populations as the undergraduates and the working population, when these two populations were considered separately; the results revealed that around 40% of the undergraduate males and females consume breakfast daily, but 54% of males and 60% of females either skip breakfast or consume sometimes. Compared to the undergraduates the working population showed a higher percentage of breakfast consumption, 72% of males and 53% of females of the working population reported that they consume breakfast daily, However 47% of the female working population yet reported to skip or consume breakfast sometimes (Fig 1). Among the skipping population 67% of undergraduate males and 76% of undergraduate females recorded that they tend to skip breakfast 1-2 days of the week, considering the working population 40% of males and 36% of females skip breakfast everyday and 56% of males and 47% of females skip breakfast at least 1-2 days per week( Fig 2).

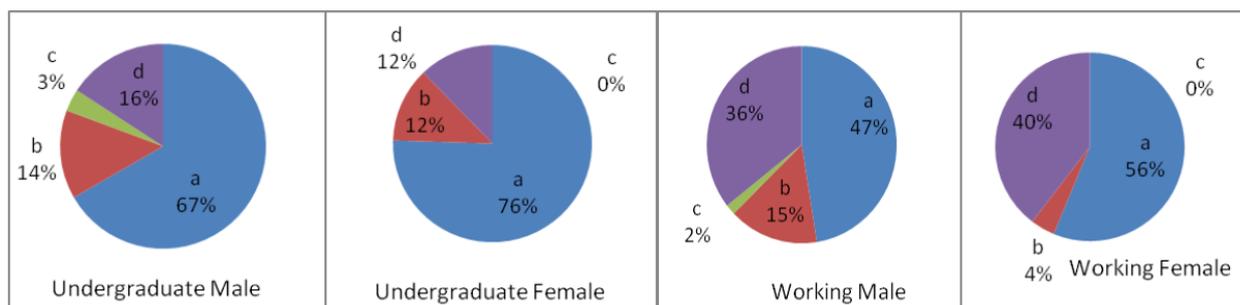


a-Yes, b-No, c-Sometimes  
**Fig 1: Consumption of breakfast**

**Reasons for skipping Breakfast**

More than 55 % of both males and females pointed out that the major reason to skip breakfast was the busy morning lifestyle (Fig 3). Results show that there is a gap between actual and required breakfast consumption of the population who has a busy life style. Considering the lifestyle of these populations, 58 % of females were recorded living a sedentary life style. When the populations were considered as a whole; the majority of the females of the working population (88%) recorded a sedentary lifestyle. People with sedentary lifestyles

can be classified as those who have occupations that do not require much physical effort, those do not walk long distances or engage in regular exercise, use motor vehicles to travel and spend their leisure with less body displacement [7]. A larger proportion of males (51 %) were recorded living a moderately active lifestyle; People with moderately active lifestyles are involves in a higher energy expenditure than those who spend a sedentary life, however they do not require strenuous energy demands [7].

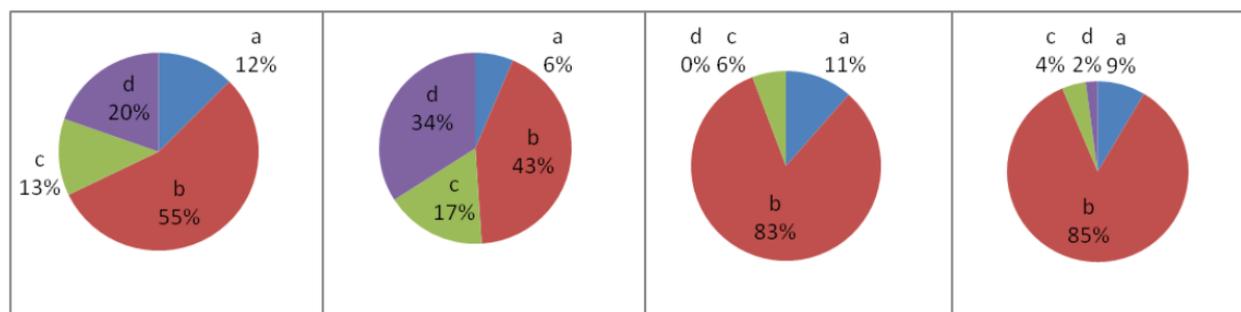


a-(1-2), b-(3-4), c-(5-6), d- Everyday  
**Fig 2: No of breakfast skip days per week**

**Awareness about the importance of breakfast meal**

A sedentary lifestyle will require less amount of energy compared to an active lifestyle. That is because the lifestyle determines the amount of calorie that is burnt. Unless used up, these calories accumulate in the body and tend to increase weight which will cause risks for non-communicable diseases. Knowing one's daily calorie needs may be a useful reference point for determining whether the calories that a person eats and drinks are appropriate in relation to the number of calories needed each day. Daily energy requirement for sedentary women of average 50kg is around 1875 kcal and a sedentary man of 60kg 2425 kcal. For a moderately active man of 60kg it is around 2875kCal (. And around 20- 30% of this energy should be included in the breakfast. Therefore a sedentary woman will require around 460kcal for breakfast while a man

requires around 600 kcal (MRI, 1989). This study also focused in seeking the level of awareness of such useful information about breakfast energy requirements. Around 90 % of both male and female populations revealed that they are aware about the importance of breakfast consumption; 96% of both males and females of undergraduates and 86% of both males and females of working population reported that they consider breakfast as the most important meal of the day. However there was no awareness about the energy requirement of breakfast (20-30% of daily energy requirement) among the male population, only 28% of undergraduates and 38% of working population males were aware about the breakfast energy requirement. But more than 50% of both female populations were aware about the breakfast energy requirement.



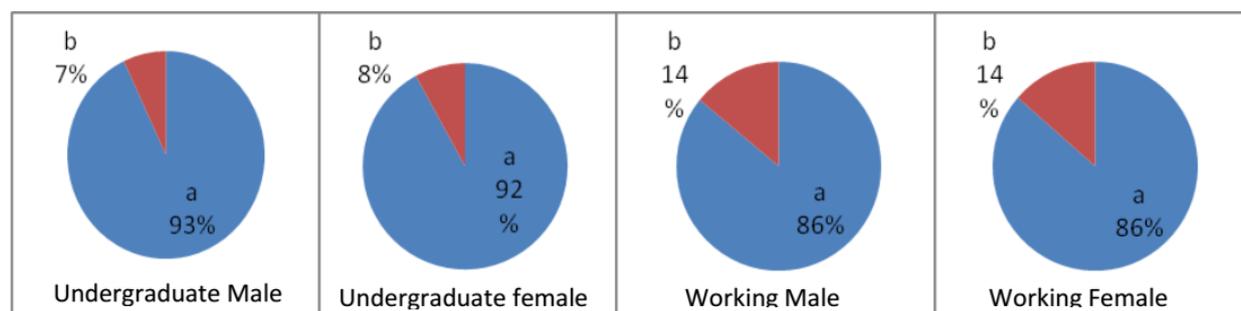
a) Too lazy, b) Busy, c) Not hungry, d) No access to food

**Fig 3: The reasons to skip breakfast**

**Preferred type of food as breakfast meal**

Rice and cereals acquired the highest preference among the type of food consumed for breakfast and the most preferred type of food for breakfast. More than 60% of both males and females of the undergraduate population and 72% of males and 83% of females from the working population recorded that rice and cereals were the most preferred type of breakfast. In addition nearly 50 % of males and 60% of females recorded that they consume milk or tea before breakfast. Therefore some amount of energy will be fulfilled by this habit. Bringing food from home was recorded to be the most convenient method of obtaining food for breakfast 58%

males and 61% of females recorded this. Around 40 % of each group preferred snack type of food or to buy their breakfast from shops. When considering about the acceptance of Ready to Eat (RTE) nutritious food for breakfast around 90 % of each group recorded their willingness to accept such a convenient RTE meal (Fig 4). Over 55% of each group recorded that the most preferred type of RTE food was a snack type bar. This depicts that there is a demand for some RTE snack type bar which is capable of fulfilling the necessary energy requirements of breakfast. Such a product will help to bridge the gap between busy life, skipping meals and consumption of nutritive foods.



a- Yes , b – No

**Fig 4: Willingness to accept a RTE meal for breakfast**

**Formulation of a RTE meal and selection of best ingredient combination**

The selected ingredients and amounts of ingredients for the ready to eat snack bar is Rice flakes: 150 g SCM: 200 g Raisins: 50 g Dates: 40g Cornflakes: 20 g Preserved papaya: 20 g Green gram: 20 g Butter: 20 g Desiccated coconut: 20 g Sugar: 25g and Semolina: 20g. These ingredients and the quantities were selected so that the breakfast energy value of an average sedentary woman is compensated.

A sensory test was performed to select the most preferred formula among the three samples 0% soaked rice flakes, 50% soaked rice flakes and 100% soaked rice flakes. According to the sensory evaluation results of the snack bars, the bar with un-soaked rice flakes was

selected as the best product. Among the sensory attributes tested it was found that there were no significant difference between the samples for appearance (p=0.239) and texture (p=0.333) whereas there were significant difference among samples for fragmentation (p=0.009), flavor (p= 0.002), grittiness (p= 0.000), and overall acceptability (p= 0.000) at 5% level of significance.

**Chemical and microbial analysis of the selected product**

The nutrient profile of a 100 g portion of the formulated high energy snack bar was, Energy 471kcal, carbohydrates 78g, proteins 1.56±0.05g, fiber 1.78g fat 6.71±0.03g and moisture: 12.66±0.21. In the microbial analysis, total plate count of the product was 5.59 X 10<sup>4</sup>

CFU/mL. The formulated high energy snack bar of 80g contained 377kcal of energy which fulfils about 80% of energy required for breakfast of an average sedentary woman and about 62% of breakfast energy requirement of an average sedentary man. For a moderately active man 120g of the bar along with a cup of tea can fulfill the breakfast requirement. Therefore bars can be formed as large size 80g and small size 40g.

#### CONCLUSION:

This study reveals that many people of the working population and undergraduates tend to skip their breakfast due to their busy lifestyle even though they are aware about the importance of breakfast. There is a good demand for nutritive ready to eat snack foods among working population and undergraduates. The formulated high energy snack bar consisted of 78.11% Carbohydrates, 1.56% Crude protein, 6.71% Crude fat, 12.66% Moisture, 1.78% crude fiber, and 0.96% ash. The high energy snack bar of 80g and 120g with a cup of milk will provide a complete breakfast for sedentary female and moderately active man respectively.

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