I INTRODUCTION

The rising rates of non-communicable diseases (chronic diseases and their associated metabolic disorders) are due to two factors namely: the demographic change and the increasing prevalence of overconsumption and inactivity associated with the Western lifestyle. These have public health and economic implications, and continue to be a matter of great concern. With the world's population aged 60 years or more increasing at more than three times the overall population growth rate and rising to about 1200 million in 2025, the importance of lifelong health promotion and disease prevention activities that can prevent or delay, the onset and severity of non-communicable diseases and promote healthy ageing should be considered (WHO, 2012).

This has resulted in continued interest in both diet and lifestyle modifications in prevention and treatment of chronic diseases. Carbohydrates are the most important nutrient of our diet, in terms of fulfilling energy requirements and other metabolic functions. They represent 45–55% of our daily energy intake, 10–15% being simple carbohydrates or sugars, the remainder being starches and oligosaccharides (Blaak et al., 2012). Carbohydrate intake has been a fairly neglected area until recently, even though carbohydrate accounts for most calories in most diets.

There is increasing evidence that both the amount and type of carbohydrate play an important role in weight management and risk of chronic diseases. Classifying carbohydrates according to their post-prandial glycemic effect (ie, the glycemic index of foods) has yielded more useful insights than the historical distinctions of simple versus complex chemical structure. Diets based on carbohydrate foods that are more slowly digested and absorbed (ie, low glycemic index diets) have been independently linked to reduced risk of type 2 diabetes, cardiovascular disease, and some types of cancer (Marsh, 2008). Glycemic index (GI) is a physiological classification of the available carbohydrate content in foods, first proposed in 1981 (Jenkins et al., 1981). The current findings, together with the fact that there are no demonstrated negative effects of a low glycemic index diet, suggest that the glycemic index should be an important consideration in the
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Determination of Glycemic Index of Selected Foods and Formulation of Low Glycemic Index Food Products

By definition, the GI compares equal quantities of carbohydrate and provides a measure of carbohydrate quality but not quantity. In 1997 the concept of Glycemic Load (GL) was introduced by researchers at Harvard University to quantify the overall glycemic effect of a portion of food. Thus, the GL of a typical serving of food is the product of the amount of available carbohydrate in that serving and the GI of the food. The higher the GL, the greater the expected elevation in blood glucose and in the insulinogenic effect of the food. The long-term consumption of a diet with a relatively high GL (adjusted for total energy) is associated with an increased risk of type 2 diabetes and coronary heart disease (Liu et al., 2000).

Rice is the most important staple and a major source of carbohydrate in the Asian diet. Rice is being widely used in human nutrition as a source of energy due to its high starch level (approximately 90% in polished white grains). However, the level of starch can vary among grains of different varieties due to genetic and environmental factors. The values of total starch can vary and the rate and extension of starch digestion can be influenced by different factors, including variation in the amylose: amylopectin ratio, grain processing, physicochemical properties (particularly gelatinization characteristics), particle size and the presence of lipid–amylose complexes.

The main differences in starch composition that influence physicochemical and metabolic properties of rice are caused by variation in the proportions of its two macromolecules, amylose and amylopectin. Amylose is essentially a linear molecule in which D-glucose units are linked by α-1,4 glucosidic bonds, while amylopectin, a branched polymer, contains both α-1,4 and α-1,6 bonds. The amylose: amylopectin ratio is inversely correlated to GI. Rice has given a wide range of results in glycaemic index (GI) studies around the world. The GI of white rice has ranged from as low as 54 to as high as 121 when bread (GI = 100) is used as the reference food (Jenkins et al., 1988; Jenkins et al., 1988; Brand, 1985). This makes it difficult to classify rice as a high- or low-GI food and advice to individuals with diabetes may be incorrect if the product has not been specifically tested first. It is likely that much of the variation in the GI of rice is due to
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Differences in the proportion of starch present as amylose, i.e. amylose: amylopectin ratio. Most rice contains 20% amylose but varieties that contain a higher proportion of amylose (e.g., 28%) have been shown to have a slower rate of digestion and produce lower glycaemic and insulin responses. The classification of rice as a high- or low-GI food may therefore depend on the amylose content of commercial varieties, but the consumer has no way of determining this from the food label.

While it may present challenges for food manufacturers to develop low glycemic index foods, it is well worth to develop these products because of the prevalence of diabetes and pre-diabetes in the region and beyond. It is estimated that by 2030, more than 16 percent of the global population will have a blood sugar problem. "Most of the risk factors are things that can be managed and modified." "We can reverse pre-diabetes and prevent it from becoming diabetes. Food has become the reason for what's ailing us, but it can actually be a solution in a number of different ways." (IFT, 2012)

During the last few years, there has been a large body of data that suggests a diet composed of low GI foods has a role to play in the prevention or treatment of a number of chronic diseases including type 2 diabetes mellitus, cardiovascular disease and cancer. Despite the existence of these supporting data the utility of glycemic index as a tool in the daily diet is still not well utilized due to lack of awareness and educational resources about the concept. Existing data also support that there is a perceived deficiency in reliable glycemic index education available to the public and the nutrition educators (Grant & Wolever, 2011). The application of the low GI concept in the prevention and management of diet related chronic diseases continues to be a topic of debate due to the following factors:

- In-vivo determination of glycemic index (GI) – methodological issues in available carbohydrate analysis and glycemic index testing. There are very few accredited glycemic index laboratories in the world providing credible data on glycemic index values for foods.
- Lack of data on the glycemic index of commonly consumed foods.
- In-vivo determination of glycemic index is very expensive and time consuming.
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- There are no locally manufactured low glycemic index products available to the consumers
- Lack of awareness of glycemic index concept

2. Objectives

In order to address the above mentioned issues, the research study was carried out with the following objectives: To

i) Determine the glycemic index and glycemic load of commonly consumed foods

ii) Analyze the amylose and amylopectin content of selected foods and ascertain its correlation to the glycemic index values

iii) Develop low glycemic index food products

iv) Determine the awareness of glycemic index concept and develop educational tools on glycemic index.