Effects Of Three Traditional Sauces Commonly Consumed In Côte D'Ivoire On Glycaemic Index Of Rice Tested In Normoglycemic Adults

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Abstract: The aim of this study was to investigate the effect of three traditional sauces commonly consumed in Côte d'Ivoire on glycaemic index of rice. On different occasions, human volunteers consumed 50 g of carbohydrate from white rice without sauce and with the palm nut sauce, groundnut sauce and eggplant sauce after 10-12 h overnight fast. Glycaemic index values were calculated after measured capillary-blood glucose before and after ingestion at 0, 15, 30, 45, 60, 90 and 120 min. The addition of the palm nut sauce (GI = 34) and groundnut sauce (GI = 45) had a lowering effect on the GI of white rice (GI = 54). Eggplant sauce increased GI of white rice (GI = 76). White rice, rice with the groundnut sauce and rice with the eggplant sauce recorded high glycaemic load values of 27, 24 and 38 respectively. Rice with palm nut sauce seems to be the best food due to its low glycaemic index and medium glycaemic load (GL = 17). The present survey reveals a significant effect of Ivorian traditional meal sauces on glycaemic index. Data showed differences of clinical importance and could be basis for dietary counseling of diabetic subjects in Côte d'Ivoire.

Index Terms: Cote d'Ivoire, Eggplant sauce, Glycaemic load, Glycaemic index, Groundnut sauce, Palm nut sauce, Traditional sauces, White rice

1 INTRODUCTION

More than 30 years ago, the concept of the glycaemic index (GI) was introduced as a means of physiologically classifying carbohydrate-containing food which could be converted to a practical tool referred to as the glycaemic load (GL) for routine dietary advice [1].

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The use of the GI has been proposed as a method to aid therapy in patients with diabetes mellitus and it can be used to slow the absorption of carbohydrate [2]. GI is defined as the incremental area under the blood glucose response curve (IAUC) after a portion of food containing 50 g available carbohydrate expressed as a percentage of that after the same amount of carbohydrate from a reference food, usually glucose or white bread, taken by the same subject [3]. Nowadays, over 2480 of common carbohydrate-containing foods have been recognized based on the GI values [4]. The international table of GI and GL is instrumental in proving the quality of research examining the relation between GI, GL and health [4]. Several researchers are of the opinion that a diet containing low GI foods may be the answer in the prevention and management of many nutrition related diseases [5]. In contrast, a high GI diet may increase the risk for chronic disease through the stimulation of hyperglycaemia and hyperinsulinemia [6]. Being one of the world's most important carbohydrate sources, the glycaemic response of rice has been investigated in numerous test meal studies. Rice has given a wide range of results in GI studies. The GI of white rice range from 54 to 133 when bread is used as the reference food [7]. In Côte d'Ivoire, rice is the most common cereal consumed with or without sauces. These sauces are characterized by their basic ingredients, which are vegetables, and seeds from which they draw their name: palm nut sauce, groundnut sauce, eggplant sauce. The sauces covers very varied dishes with one ingredient to composite sauces containing different vegetable and/or animal products. Sauces can be liquid or semi-fluid, and are sometimes heterogeneous in texture with solid morsels [8]. The average consumption of rice in Côte d'Ivoire was reported as 60 kg/year per person [9]. There are several factors that may alter the GI of rice, these include: food structure, ripeness, ratio of amylose and amylopectin, the level of food processing, cooking technique and the presence of other macronutrients such as lipid and protein [10]. The addition of lipid and protein to a carbohydrate meal can significantly reduce the glycaemic response [11]. Thus, the sauce accompanying the rice meal would have an effect on the GI of the meal, since each component (carbohydrate-protein-lipid) of a complex meal has a unique area located under the glycaemic response curve. This could make considerable modifications to the hyperglycaemic capacity of the meal. The purpose of the study therefore was to investigate the effects of three multi-ingredient sauces commonly consumed in Côte d'Ivoire on the GI of rice in normoglycaemic adults. This will make it possible to give more precise nutritional recommendations in the prevention and management of metabolic diseases such as diabetes mellitus and also, help predict the possible effect of eating the traditional meals in Côte d'Ivoire with a given sauce.

2 MATERIALS AND METHODS

2.1 Setting

Study was conducted at the Department of Foods Sciences and Technologies of the Nangui Abrogoua University and at the Faculty of Medical Sciences of Felix Houphouet-Boigny University using internationally recognized GI methodology [3], [12].

2.2 Subjects

Ten normal, healthy subjects were recruited to participate in the study. Subjects were physically examined by a medical doctor on the basis of the following criteria: age 18 – 55 years; body mass index (BMI) 20 – 25 kg/m^2 (WHO criteria); fasting blood glucose 4 – 7 mmol/L. Exclusion criteria were as follows: active gastrointestinal or metabolic disease (e.g., celiac disease), first-degree family history of diabetes, and a current course of medication. Pregnant and lactating women were also excluded. Subjects were staff and students from Nangui Abrogoua University. Ethical approval for the study was obtained from the Medical Sciences Faculty of Felix Houphouet-Boigny University. Subjects were given full details of the study protocol and the opportunity to ask questions. All subjects gave written informed consent prior to participation. All anthropometric measurements were made in the fasting state. Weight was recorded to the nearest centimetre using a stadiometer (Seca Ltd, UK), with subjects standing erect and without shoes. Body weight was recorded to the nearest 0.1 kg, with subjects wearing light clothing and no shoes. BMI was calculated using the standard formula: weight (kg)/height $(m)^{2.}$

2.3 Preparation of experimental diets

Four test meals (white rice, rice with groundnut sauce “riz à la sauce arachide”, rice with eggplant sauce "riz à la sauce gnagnan" and rice with palm nut sauce “riz à la sauce graine”) and a reference food (Pure anhydrous glucose, COOPER, Place Lucien Anvert) were administered to subjects in a randomised, repeated measures design with each subject serving as his own control. Boiled white rice was given as the standard food. All the ingredients used to make each of these meals in this study were purchased from the local supermarket and the raw foods were cooked by the traditional method used in the daily-life of Ivoirians [11]. The different sauces chosen for this study were the ones commonly consumed with boiled rice in Côte d’Ivoire [8]. The ingredients and the preparation methods were based on common practices. The reference food (glucose powder dissolved in 250 ml of water) was tested three times by each subject. Subjects were served with boiled white rice containing 50 g of available carbohydrate [12], defined as total carbohydrate minus total dietary fiber. The foods were prepared and portions were weighed on digital scales to the nearest gram on the morning of the test. It was not possible to make them identical in taste, texture, appearance and lipid content, but all the meals were made of traditional dishes, and were well accepted by the subjects.

2.4 Proximate analysis

The Laboratory of Food Biochemistry and Technology of Tropical Products of Nangui Abrogoua University analyzed the chemical composition of the study meals. Each part of the meal (white rice and sauces) was analyzed for dry matter, lipid, protein and total fiber using standard AOAC methods [13]. Dry matter content was determined by oven drying at 105 °C for 20 h. The protein content was estimated (nitrogen × 6.25) by quantitative analysis of nitrogen using the Kjeldahl method. The lipids were measured gravimetrically by extraction in diethyl ether and petroleum ether after hydrolysis with acid. Total fiber was measured after acid hydrolyse. Available carbohydrate was calculated by difference according to FAO/WHO [12]. Samples were analysed based on fresh matter and all analyses were in triplicate.

2.5 Experimental design of study

2.5.1 *In-vivo* test and blood sample analysis

On seven (7) different occasions in the morning, subjects were tested after 10-12 hour overnight fasts. No restrictions were placed on the meal that was eaten prior to the test. On the first three occasions, subjects consumed 50 g of glucose dissolved in 250 ml water. On the other four occasions the subjects consumed a portion of one of the 4 test foods. All test foods were served with 250 ml of water. Each subject consumed the test foods over a 5 to 10 mins period. Finger prick capillary blood samples were taken fasting and at 15, 30, 45, 60, 90 and 120 mins from when the subject first started eating using hypodermic needle or lancets. Each blood sample was placed on a test strip which was inserted into a calibrated glucometer (One touch) which gave direct readings after 15 seconds based on glucose oxidase assay method.

2.5.2 Calculations and statistical analysis

The GI values of four test meals (white rice , rice with groundnut sauce, rice with eggplant sauce and rice with palm nuts sauce) were determined using the previously described standard protocol [12] with anhydrous glucose as the reference food (GI = 100). Incremental Area Under the Curve (iAUC), ignoring area beneath the fasting level were calculated geometrically by applying the trapezoid rule [3]. The iAUC was determined for each test and three reference glucose solutions. The mean, standard deviation (SD) of the iAUC of each subject’s repeated reference food tests were calculated. The iAUC for each food was expressed as a percentage of the mean iAUC for glucose taken by the same subject and the resulting values averaged to give the food GI. The GI of each meal tested was taken as the mean (± SD) for the whole group. GI values were categorized into three groups according to their GI [14], food with GI < 55 is called low GI food, and high GI food means food with GI > 70, food with GI ranging between 55 - 69 is called medium GI food. GL for each food was determined by the method of Salmerón et al. [15]. For each individual, the GL was calculated by multiplying the percentage carbohydrate content of food in a typical serving by its GI value. GL values were classified as low (GL ≤ 10), medium (10 > GL < 20) or high (GL ≥ 20) [16]. Unless otherwise stated, statistical analysis of the results covers calculation with the means and standard errors. Calculations and the figures were done using the Excel 2010 software of Microsoft Office. Data were subjected to repeated-measures analysis of variance. After demonstration of significant heterogeneity, the significance of differences between individual mean blood glucose concentrations at each time and iAUC and GI/GL values were determined using the Dunnett test method to adjust for multiple comparisons. Chemical composition values were subjected to repeated measures ANOVA followed by Duncan's test. If significance was reached ($P < 0.05$) the test of least significant differences (LSD) was applied as the post hoc test. Moreover, Spearman rank correlation (Rô) test were calculated to explore a potential correlation between GI and the various dependant variables. The pooling analysis was carried out with the threshold of significance level of 5 %, using SPSS software (version 17.0 Statistical Package for Social Sciences, Inc, Chicago, IL, USA).

3. Results

Demographic characteristics of volunteers: Six males and four females completed all four test meals (Table. 1). Their ages ranged from 23 to 36 years, their fasting capillary glucose (4.1 to 5.5 mmol/L) their BMI ranged from 18.1 to 24.9 kg/m^2 i.e. within the normal healthy class of BMI and fasting glucose classification respectively. The composition of the test meals are shown in Table 2 and expressed in terms of the portion size that was fed to each subject. Food composition among food products is very different. Rice with groundnut sauce is higher in proteins (9.7 ± 0.1 g, $p < 0.05$) and ash (1.3 ± 0.0 g, $p < 0.05$) in comparison to the other test foods.

Table 1: Demographic information and clinical characteristics on the Study Subjects (six males and four females).

Parameter	Age [years]	BMI [kg/m2]	Systolic blood pressure [mmHg]	Diastolic blood pressure [mmHg]	Fasting capillary glucose [mmol/L]
Mean ± S.D*	28 ± 4	21.2 ± 2.3	113 ± 9.5	68 ± 12.3	5.1 ± 0.5
Range	23 – 36	18.1 – 24.9	100 – 130	50 – 80	4.1 – 5.5

**Standard deviation*

Table 2. Nutrient composition and energy values* of four tested meals

Meals	Moisture	Proteins	Lipids	Total dietary fiber	Ash	Available CHO**	Energy***	GI testing portion
	[g/portion]						[kcal/portion]	[g]
Rice	122.9 ± 0.1^d (122.8 – 122.9)	7.3 ± 0.1^d (7.3 – 7.5)	0.4 ± 0.0^d (0.4 – 0.4)	0.2 ± 0.0^d (0.2 – 0.2)	0.9 ± 0.0^c (0.9 – 0.9)	50.0 ± 0.1^d (49.9 – 50.1)	233.6 ± 0.3^d (233.4 – 233.9)	181.7 ± 0.4^a (181.2 – 182.0)
Rice with groundnut sauce	156.9 ± 0.0^c (156.8 – 156.9)	9.7 ± 0.1^a (9.6 – 9.8)	5.5 ± 0.0^b (5.4 – 5.5)	0.6 ± 0.0^c (0.6 – 0.6)	1.3 ± 0.0^a (1.2 – 1.3)	52.9 ± 0.1^a (52.7 – 53.0)	301.8 ± 0.1^b (301.5 – 301.8)	226.9 ± 0.4^b (226.2 – 22.0)
Rice with eggplant sauce	163.9 ± 0.0^a (163.8 – 163.9)	8.5 ± 0.1^b (8.5 – 8.6)	0.5 ± 0. 0^c (0.4 – 0.5)	2.2 ± 0.0 ^{a} (2.2 – 2.2)	1.2 ± 0.0^b (1.2 – 1.3)	50.4 ± 0.1^c (50.3 – 50. 5)	248.8 ± 0.2^c (248.5 – 248.9)	226.9 ± 0.4^b (226.2 – 22.0)
Rice with palm nut sauce	157.6 ± 0.1^b (157.3 – 157.4)	8.1 ± 0.1^c (8.1 – 8.2)	7.7 ± 0.0^a (7.6 – 7.7)	1.8 ± 0.0^b (1.8 – 1.8)	1.2 ± 0.0^b (1.2 – 1.2)	50.6 ± 0.1^b (50.5 – 50.7)	311.3 ± 0.3^a (310.9 – 311.3)	226.9 ± 0.4^b (226.2 – 227.0)

*$^{(a,b,c,d)}$ Values with no common letter in the same column are significantly different ($p < 0.05$), as assessed by Duncan's test. **Available carbohydrate values are calculated as follows: 100 - (moisture + protein + lipid + total dietary fiber + ash); AOAC Analysis (AOAC, 2005). * Means ± standard deviation. CHO, carbohydrate. *** Energy Value = 4 x (g) Available carbohydrates + 4 x (g) Protein + 9 x (g) Lipids; (-): range.*

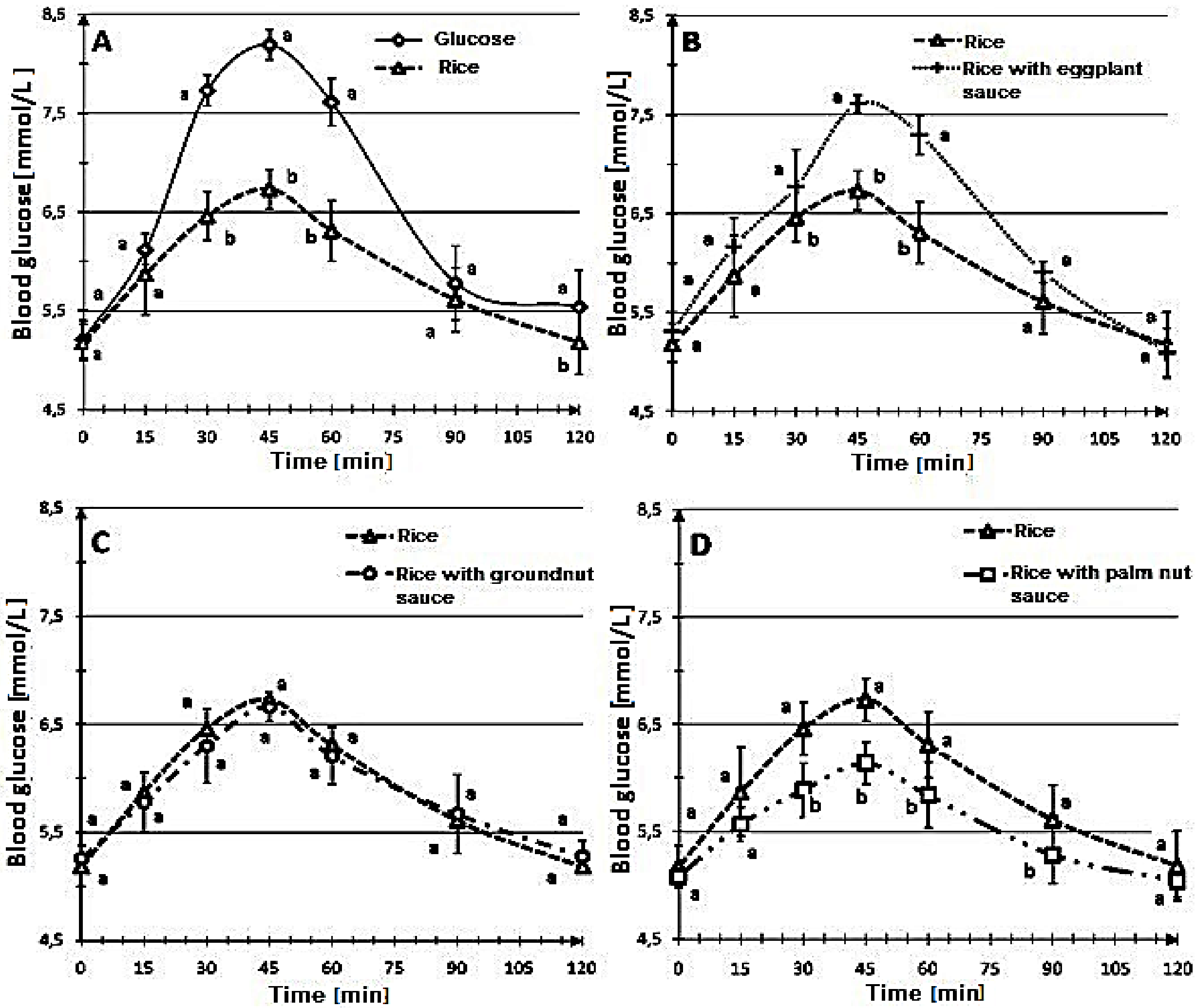

Fig. 1. Glycaemic profile (mmol/L) of foods study; (A) Blood glucose response elicited by test foods of rice compared to glucose (B) Blood glucose response elicited by test food of rice with eggplant sauce compared to rice (C) Blood glucose response elicited by test food of rice with groundnut sauce compared to rice (D) Blood glucose response elicited by test food of and rice with palm nuts sauce compared to rice. Points at the same time interval and vertical bars with different letters are significantly different ($p < 0.05$). Values are the mean for 10 subjects.

Rice with palm nut sauce and rice with eggplant sauce are also higher in lipids (7.7 ± 0.0 g, $p < 0.05$) and total dietary fiber (2.2 ± 0.0 g) respectively in comparison to the other test foods. The postprandial glycaemic excursion of foods tests is graphically depicted in Fig. 1. The fasting concentrations of glucose were similar for the four test meals, whereas the incremental response areas were lower for all test foods compared to glucose ($p < 0.05$). The analysis included the comparison of blood glucose response elicited by test food of rice with sauce compared to rice without sauce. When subjects consumed test meals containing palm nuts sauce, the postprandial rise in blood glucose of rice only meal was reduced ($p < 0.05$, Fig. 1C), iAUC, GI, GL values and classification of each test meal are presented in Table 3. The calculated GI ranged from 54 ± 2 for the rice meal without sauce, to 45 ± 1 for the rice with groundnut sauce meal, to 34 ± 1 for the Rice with palm nuts sauce meal and to 76 ± 1 for the rice with eggplant sauce with significant differences among the meals ($p < 0.05$). GL ranged from 27 ± 1 for the rice meal without sauce, to 24 ± 1 for the rice with groundnut sauce meal, to 17 ± 1 for the rice with palm nuts sauce meal and to 38 ± 1 for the rice with eggplant sauce with significant differences among the meals ($p < 0.05$). Except for meals with eggplant sauce, the addition of the groundnut sauce or palm nuts sauce had a lowering effect on the GI of the carbohydrate-rich foods (Table 3). There was a negative correlation between the GI of foods tests and lipid intake (ro = - 0.77; $p < 0.01$) and between the GI of foods tests and caloric intake (ro = - 0.77; $p < 0.01$). The available carbohydrate of the tests foods was significantly correlated with the GI values (ro = - 0.58; $p < 0.01$). However, no significant relation was observed between other nutritional compounds and GI of foods tested (data not shown). A positive correlation was also found between the fasting glycaemia values and the GI of food tested (ro = 0.46; $p < 0.01$).

TABLE 3. iAUC, GI/GL VALUES" AND CLASSIFICATION FOR EACH TEST MEAL

Test Meals	iAUC-glucose [mmol/L*120min]	iAUC-test foods [mmol/L*120min]	GI value	GI classification	GL value	GL classification
Rice	170 ± 29 (120 – 233)	92 ± 5[a] (84 - 101)	54 ± 2[a] (50 – 57)	Low	27± 1[a] (25 – 28)	High
Rice with groundnut sauce	170 ± 29 (120 - 233)	78 ± 3[a] (74 - 86)	45 ± 1[b] (44 – 48)	Low	24 ± 1[b] (23 – 25)	High
Rice with eggplant sauce	170 ± 29 (120 - 233)	129 ± 7[b] (120 - 143)	76 ± 1[c] (73 – 78)	High	38 ± 1[c] (37 – 39)	High
Rice with palm nut sauce	170 ± 29 (120 - 233)	59 ± 4[c] (54 - 66)	34 ± 1[d] (32 – 36)	Low	17 ± 1[d] (16 – 18)	Medium

" Means ± standard deviation; iAUC = Incremental Area under the plasma glucose curves; GI = Glycaemic Index; GL = Glycaemic load. Means in the same column sharing the same letter superscript (abcd) not differ significantly (p < 0.05). (-): range

4. DISCUSSION

4.1 Glycaemic response

Analysing the different glycaemic profiles (Fig. 1), the present data revealed the effect of three different sauces eaten with rice on the postprandial glycaemic response. The changes in postprandial glycaemic values of tests foods observed were comparable because there was no significant difference ($p < 0.05$) between the fasting glycemia values of the check food (rice without sauce) and the meals of rice with sauces. These changes can be accounted for by an increase or decrease in the area under the glycaemic response curve when rice is eaten with sauces. In fact, the iAUC of rice with eggplant sauce increased significantly by about 40 % compared to that of the rice ($p < 0.05$, Fig. 1B) while the iAUC of rice with palm nut sauce decreased by 36 % with respect to rice ($p < 0.05$, Fig. 1D). A non-significant reduction in iAUC (- 15%) was observed when the rice was eaten with groundnut sauce ($p > 0.05$, Fig. 1C). These results show that palm nut sauce and groundnut sauce reduce glycaemic responses by delaying gastric emptying during the digestion of these meals [17]. This explains the low amplitude of the waves of postprandial hyperglycemia for rice with palm nut sauce (6.1 ± 0.2; 6.7 ± 0.1 and 6.7 ± 0.2 mmol/L at T = 45 mins respectively) and rice with groundnut sauce and the carbohydrate absorption and distributed in terms of time. These physiological aspect of the foods helps prevent metabolic disorders [2]. These sauces contribute to maintaining blood glucose levels as close to normal as possible preventing long-term complications of diabetes type 1 and type 2 [6]. The eggplant sauce had an opposite effect, increasing the glycaemic response. This could be attributed to the quality of carbohydrates that it might contain and the new physico-chemical conditions brought about by the addition of the sauces such as pH, viscosity, titratable acidity etc. The present results are in accordance with some studies of Nientao et al. [18]. Their work showed a significant influence of African traditional meal sauces on glycaemic response.

4.2 Glycaemic index, glycaemic load

Elucidating the effect of carbohydrate-rich foods in human nutrition requires a control of the quality of sugars as well as the physiological properties [19]. Thus, the present study tested the GI and GL of rice meals. The different glycaemic responses of tests foods permitted the determination of the following GI: 54, 35, 46 and 76 for rice (rice without sauce), rice with palm nut sauce, rice with groundnut sauce and rice with wild eggplant sauce respectively. With the exception of rice with eggplant sauce, the control food (rice without sauce), rice with palm nut sauce and rice with groundnut sauce had GI below 55 hence. They could be classified as low GI foods according to the International Classification of foods [4, 12] such as rice (GI = 46), "millet" (GI = 38) and "fonio couscous" (GI = 40) [20] and are recommended for diabetic subjects [2, 21]. These foods are less hyperglycaemic, than oats and maize with belong to the group of intermediate GI foods ($55 < GI \leq 70$) and Tapioca with milk, glucose and honey with belong to the group of foods with high GI ($GI > 70$) [4]. It was also mentioned that these foods could induce a more durable sensation of satiety than high GI foods [19], a hypothesis that was not tested in this study. The mechanism involved is that, the carbohydrates contained in these foods are digested and absorbed slowly but steadily in the blood, resulting in a gradual and generally weaker increase in glucose [22]. On the contrary, rice with wild eggplant sauce have very significant hyperglycaemic-inducive power ($GI > 70$) and hyperinsulinaemia effect, a key factor for glycaemic disturbance that is deleterious to the body [23]. The addition of sauces to rice significantly modifies the GI. The wild eggplant sauce increased the GI value of the rice meal by 41 % shifting it to the category of high GI foods ($GI > 70$). Despite the reduction in GI value of rice meal by 35 % and 15 % when palm nut sauce and ground nut sauce respectively were added, their classification remained unchanged (Fig. 1). The addition of palm nut sauce and groundnut sauce had significantly beneficial effect on the carbohydrate regulation of the body since the GI was relatively low ($GI \leq 55$) compared to the GI resulting from the addition of the wild eggplant sauce ($GI > 70$). The modifications in the GI of rice observed could be attributed to the effect of the cooking on the nutritional component of the meals changing its digestibility and GI [24]. This confirms the effect of carbohydrate-protein-lipid interactions and lipid in a mixed meal on GI [25]. Although, rice without sauce, rice with palm nut sauce and rice with groundnut sauce are considered the best choice according to quality indicators, their GI is not the only factor of relevance [26]. The GL (both qualitative and quantitative classification of a given portion of carbohydrate-rich food) is also considered in support of the hygieno-dietary recommendations [27]. The present study found the foods tested on the average had GLs higher than 24, except for rice with palm nut sauce which recorded mean GL of 17.5 ± 0.8. In reference to the food classification by GL proposed by Mendosa [28], rice without sauce, rice with groundnut sauce and rice with wild eggplant sauce could be classified as foods with high GL (GL > 20). Rice with palm nut sauce is one of the foods with medium GL (11 < CG < 19). Thus, the three meals with high GL can be injurious to health in spite of their GI because they have glycaemic-inducive potential. Therefore, in order to avoid the metabolic disorders related to their high consumption, a diet based on moderate amount of these foods will help to meet the daily GL [29]. This will help to reduce the energy density of food ingested and hence, the caloric intake that could cause metabolic disorders [30].

4.3 Factors affecting glycaemic index

The glycaemic response is the result of some complex metabolic phenomena, especially in the context of a mixed meal [26]. In addition, several factors can affect the GI of a meal [2]. This study found a significant linkage between the GI, levels of available carbohydrate (ro = - 0.58, $p < 0.01$), lipid (ro = - 0.77, $p < 0.01$) and energy intake (ro = - 0.77, $p < 0.01$). Moreover, fasting glycaemia values also correlated with the GI values (ro = 0.46, $P < 0.01$). From the above, the GI value does not depend only on the biochemical composition foods but also on the fasting glycaemia. Besides, correlative analyses imply two aspects as regards the coefficients of correlation associated with each variable. The first aspect is reflected in the increased levels of lipids, available carbohydrates and energy-giving values leading to the reduction of GI. Thus, the reduction of the GI of foods eaten due to the ingestion of high amount of lipids might be as a result of the modulation of gastric emptying. Scheen et al. [31] confirmed that factors specific to the body (such as the speed of gastric emptying) may affect the glycaemic response and GI of foods. Lipids are known to slow gastric emptying [32]. This phenomenon was particularly demonstrated in the work of Norman et al. [33] when the shortage of fancy pastes (noodles) with carbon 13, helped show that the presence of glucose in the blood originating from the pastes were slowed down by the addition of oil. Again, the reduction of the GI could be coherently inferred, as we refer to the increase in calorie intake, given that an excessive intake of lipids which are the most energy-giving foods (9 versus 4 kcal/g) is accompanied by a total increased energy intake of foods tested [19]. Besides, the reduction of the GI of the meals resulting from a high level of available carbohydrate might be due to carbohydrate-lipid interactions. In fact, because of their role as “steric protectors” these interactions firstly disturb the contact between the carbohydrate part of the foods as well as carbohydrate-lytic enzymes, the contact between the assimilable molecules and the intestinal mucous membranes, delaying the arrival of the latter in the blood [11]. As a result, available carbohydrates are not immediately absorbed, reducing the GI. From all the above, the GI of meals being basically made of rice depend more on the mechanism than on the absorption of glucose. The second aspect of the correlative analysis is that the GI value does not depend only on glucose availability in the food, but also on the fasting glycemia and the carbohydrate quantity ingested in the previous meal. This could explain the influence of the last carbohydrate intake or the fasting glycemia on the GI. This confirms that the GI depends more on glucose metabolism than glucose absorption [34]. In order to avoid a greater variability of the GI, it is suggested to include in the determination protocol of the GI values, a normalized interval of fasting glycaemia before carrying out the tests or to include in the method a standardized carbohydrate quantity in the evening meal before the experiment.

5. Conclusion

The present work demonstrated through an exploratory analysis of glycaemic profiles of the Ivorian traditional meals, the effect of accompaniment sauces on the postprandial glycaemic response and GI. The palm nut and groundnut sauces had the effect of reducing the rise in blood glucose contrary to the wild eggplant sauce. From these facts, the rice with palm nut or groundnut sauce could all be recommended as hygieno-dietary foods in the prevention and treatment of diabetes mellitus. However, their consumption must take into account the daily GL which must not exceed 80 in terms of value. Besides, the GI determined are greatly due to physico-chemical characteristics of the meals and also the fasting glycaemia which deserves a value or a normalized interval so as to avoid too great variability of GI for the same food.

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