ANALYSIS OF THE REST-INTAKE INDEX AND DIRTY LEFTOVERS IN A FOOD AND NUTRITION UNIT (FNU) OF A HOSPITAL

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ABSTRACT

In Food and Nutrition Units, the use of indicators that assess acceptability, quality, quantity and the amount of food produced are essential, since such characteristics are associated with the waste of food experienced by the unit, which consequently impact on profitability and damage caused to the environment. In this regard, the rest-intake index and dirty leftovers act as indicates that provide such evaluation. The aim of this study was to evaluate the rest-intake index and the dirty leftovers of a food and nutrition unit of outsourced management in a hospital in Vitória da Conquista, Bahia, Brazil. The analysis was performed with lunch meals intended for consumption by hospital employees. A scale with a capacity of 300 kilos was used to quantify the total food produced, the remains left on the plates and the leftovers from the distribution counter. The average daily consumption was 0.45 kg per capita, with a percentage of rest-intake index of 5.21%, and dirty leftovers of 12.56%; while the per capita in grams was 52.07 and 64.41, respectively, thus showing values above those considered acceptable. The presented results indicate the need to reformulate the actions and strategies associated with management, standardization of routines, through training and educational actions that help reduce waste.

Keywords: Meal Producing Unit; Food consumption; Waste; Environment.

1. INTRODUCTION

In Brazil, there is a growing demand for food consumption outside homes as a reflex of the needs of the contemporary world (Silva et al., 2020a). It is believed that a major contribution to this outcome is the changes in the lifestyle of the population, which are at an increasingly accelerated pace. Thus, this ends up directly interfering in people's eating habits and searching for practicality and ready-to-eat foods and/or eat meals outside the home (Silva et al., 2020b; Bezerra et al., 2016; Souza et al., 2021; Costa et al., 2021). Among them, stands out commercial and institutional restaurants (in industries, day care centers, and hospitals), convenience stores, fast food chains, bakeries, among others (Bezerra et al., 2017).

One of the most worrisome factors regarding the consumption of food outside the home is associated with waste. Filimonau et al. (2019) claim that much of this discarded waste has its origin in the customers' dish. In Food and Nutrition Units, considering a high production of meals, these residues negatively affect the use of natural resources, the degradation of the environment and still interfere in the profitability of the company (Wang et al., 2017).

In this sense, to avoid excessive production of waste, the provided menu should preferably be those experienced by the Unit (Abreu & Spinelli & Pinto, 2019). In addition, the manager must monitor, compare and evaluate the procedures developed by employees in all stages of meal production (Saurim & Basso, 2008).

Thus, evaluating waste in Food and Nutrition Units is also related to the quality of services provided (Martins & Epstein & Oliveira, 2008). In this sense, it is common to use indicators that help in this process, among them can be pointed: the rest-intake index and dirty leftovers. Vaz (2006) defines the rest-intake index as the amount of food returned on the plate or tray by the customer. Dirty leftovers are defined as ready-made foods that have not been distributed and remained at the distribution counter (Quemelli & Nogueira, 2021).

The analysis of these indicators become relevant due to the evaluation of the quality of the service with better planning and acceptability of the menu provided by the unit. Besides, it may culminate in positive economic effects to the company since the organization of resources destined to the purchase of food will be better controlled with reduction of waste (Rabelo & Alves, 2016). Therefore, this study aimed to evaluate the rest-intake index and dirty leftovers of a Food and Nutrition Unit in a hospital in Vitória da Conquista, Bahia, Brazil.

2. MATERIAL AND METHODS

The study was classified as cross-sectional, quantitative, field-based and descriptive (Pereira et al., 2018). The research was carried out in a Food and Nutrition Unit of a public hospital in Vitória da Conquista, Bahia, Brazil, managed by a private concessionaire in the food sector, and meals were intended for the consumption of the hospital's collaborators. The analysis was performed during 10 consecutive days, being

evaluated in the lunch shift, because it is the one with the highest number of meals distributed.

The Unit had a menu with preparations that are according to the recommendations of Fonseca and Santana (2012), classified as being of Popular Standard or Trivial Simple composed of rice, beans, a type of salad, two types of proteins, a garnish and a dessert that varies between fruit or sweets. The distribution system of the Unit was a centralized and self-service system, however, the form of access of the main course and dessert was served by a collaborator of the Food and Nutrition Unit. Guests were served on porcelain plates, measuring 27 cm in diameter. All prepared meals were deposited in stainless steel vats and stored in heated *pastru* before being arranged on the thermal counter, or in a refrigerator intended for refrigerated preparations (in this only purpose).

For data collection, the number of meals served in the period was monitored, in addition, the weight of the empty vats (kg), weight of the vats with the food (kg), the weight of the dirty leftovers and the weight of the rest ingested (kg) were obtained. For this, a scale (Ramuza®) was used, with a minimum capacity of 0.5 kg and a maximum of 300 kg. To determine the rest-intake index (% and per capita), the remains left by the customers were separated from the inedible parts (napkins, toothpicks, bones, fruit peels, among others) and then were weighed, considering to disregard the weight of the container in which it was collected.

In the determination of the dirty leftovers, the remaining food in the vats were weighed, after the end of the mealtime. Disregarding the weight of the vats, the actual value of the leftovers was reached, followed by the per capita and percentage Table 1 presents the formulas used to calculate the evaluated indicators, according to Vaz (2006):

Table 1 - Formulas for calculating the evaluated indicators.

Nº	Fórmulas	
1	$\%RI = \frac{Weightoftherest}{Weghtofdistributedmeal} x100$	$RIPercapita = \frac{Weightoftherest}{nºofdistributedmeal}$
2	$\%DL = \frac{Weightoftheleftovers}{Weightofthedistributedmeal} x100$	$DLP.capita = \frac{Weightoftheleftovers}{nºofdistributedmeals}$
3	$Percapitaconsumption(kg) = \frac{Wheightofthedistributedmeal}{nºofdistributedmeals}$	
4	$PFR = \frac{Wheightoftherests}{Percapitaconsumption}$	$PFL = \frac{Wheightofthelevtovers}{Percapitaconsumption}$

Formulas 1, 2, 3 and 4 refer respectively to: Rest-Intake (RI) in % and Per capita (kg); Dirty Leftovers (DL) (%) and per capita (kg); Per capita consumption (kg); People Fed With Rests (PFR) and Leftovers (PFL). The data were tabulated in an Excel

spreadsheet® 2013 version and the results were expressed in means and standard deviation.

3. RESULTS AND DISCUSSION

An average of 128 people per day were attended, ranging from 69 to 174, and the lowest number was registered at the weekend, with an average per capita consumption of 0.45 kg. It was observed that the rest-intake index had slight variations during the analyzed period, and the days of greatest waste were those evidenced on the 3rd, 9th and 10th day. Regarding to the dirty leftovers, it was found that the highest value was evidenced on the 5th day of analysis. The high value found for dirty leftovers may be associated with possible failures in the quantification of the number of customers, which may have been overestimated, culminating in excessive production. Table 2 highlights the average of values found for rest-intake index (% and per capita) and dirty leftovers (% and per capita).

Table 2 - Evaluated quality indicators.

Indicators	%	Per capita (g)	Reference (%)	Reference* (g)
Rest-Intake	5,21 ±1,41	52,07 ± 14,16	2 a 5%	15 a 45g
Dirty Leftovers	11,99 ± 6,24	64,41 ± 42,35	3%	7 a 25g

* Reference values described by Vaz (2006).

The analyzes of the average of the rest-intake index showed that the results are above the values recommended by Vaz (2006). Despite the existence of other reference values higher than those considered by Vaz, such as those mentioned by Bradacz (2003), in this study, we chose to adopt as reference the Vaz indicators (2006). This decision was taken since Anjos et al. (2017) and Scotton, Kinaz and Coelho (2010) suggest that lower values should be set considering that in paid restaurants the index is almost zero. Therefore, following values equal to or greater than 10%, will lead the unit to errors, and consequently, this will produce high rates of waste.

In a study conducted by Soares et al (2018) in a university restaurant in Piauí, Brazil, considering five consecutive days, the average of the rest-intake index during the study period was 16.76%. The value found is considered unacceptable according to Vaz (2006), which establishes as acceptable values of up to 5%.

In a research conducted by Borges, Neta and Lopes (2016) in a self-service restaurant (municipality of Juazeiro do Norte, Ceará, Brazil) for seven days, the obtained rest-intake index was 0.01%. Thus, within the acceptable values described in the literature. According to the authors, this percentage represents not only the control of waste and expenses, but also the quality of food available to customers.

According to Anjos et al (2017), the loss resulting from the rest-intake index is very considerable within a Food and Nutrition Unit can be explained by the lack of

greater commitment of the dinner in relation to the value of the food served and despised.

Nascimento et al (2020) also point out that the negative rates of rest-intake may be associated with the way food is prepared, in addition to the acceptability by certain foods related to cultural characteristics, religious precepts, health problems and food preferences of consumers.

Besides, Anjos et al (2017), state that the size of the dish is another important variable in the reduction of waste by index of rest-intake. According to these authors, the offering of large dishes for customers, induces them to put more food, and consequently have more rest-intake indexes.

It is noteworthy that, with the remains evidenced in the present study, it would be possible to feed approximately 12 people daily, which added to the 10-day period could serve 120 people. Therefore, the managers should seek solutions to reduce these rates.

Viana and Souza (2016) showed a positive change in the rates of rest-intake index in a survey performed in Porto Velho, Rondônia, Brazil, after an awareness campaign in an FNU, which obtained a reduction of 9.8% of the total rest that was discarded. These authors point to a decrease in the average from 3.0% to 2.6% in the percentage of rest-intake and from 20 to 10 g referring to the rest per capita.

Machado et al (2012) also present positive results generated through an educational intervention in Anápolis, Goiás, Brazil, showing a 9.8% reduction in the

rest-intake index. Also, a set of studies made by Stocco (2020) showed a 33% reduction in food waste by diners, after an awareness campaign on food waste, entitled "Operation Clean Dish in Action".

Thus, Pereira, Santos and Mattos (2020) state that it is efficient to implement actions aimed at environmental education related to the reduction of the rest-intake index. This observation is because it can be applied through activities that minimize waste per capita of the rest-intake index, bringing consumers interest in the environment. In addition, presenting information and knowledge to the population, as can be seen in posters, sensitize them about the recognition of positive attitudes regarding non-waste and negative effects of wasting food.

Regarding the dirty leftovers in % and per capita, both were higher than the values recommended by Vaz (2006), which states up to 3% or from 7g to 25g per person as acceptable values.

It can be seen that much of the leftover is concentrated in rice and beans, when compared to the other preparations on the menu. Therefore, Fonseca and Santana (2012) state that there is a need for changes regarding the composition of rice and beans, and the FNU can modify the way of preparation, color and insertion of other ingredients or seasonings, transforming a daily base dish into something with better presentation and consequently with greater acceptability.

In consonance with Vaz (2006), that waste is intrinsically related to the appropriate planning for the unit, and the manager must consider several aspects

when planning the menu (along with the seasons) because in each climatic period there is a pattern of consumption that must be observed and planned.

It is worth to mention that in the period of the research, waste from dirty leftovers could feed an average of 19 people per day, which corresponds to 190 people in the period of the tests. These values were lower than the mentioned by Soares et al (2018), which showed a waste by rest-intake index on average of 119kg/day, which would feed about 156 people. According to the aforementioned authors, to reduce this index it is necessary to have planning in the distribution associated with educational measures. As the waste concerns the variables rest-intake index and dirty leftovers, the total meals that could be served in the analyzed period corresponds to 310 people, which means, 31 people/day. Thus, measures should be adopted to reduce such variables in the evaluated Unit.

It is also important to highlight some national initiatives to combat food waste. Nascimento et al. (2020) presented as an example regulation No. 13,327/2002, implemented in the city of São Paulo that defines the social program "Food Bank", which has the objective of collecting food donations and making their distribution directly or through institutions that are previously registered to people and/or families in situations of social vulnerability.

In addition, the Food and Agriculture Organization of the United Nations (FAO) also mentions other actions that have occurred in Brazil, for example, the Brazilian Network of Food Banks, implemented by the Ministry of Social Development and Fight

against Hunger and the social program "Mesa Brasil" from SESC (Commerce Social Service). They consist in food and nutrition security programs, which have foundations based on actions of education and distribution of surplus foods and/or that do not fit the acceptable standards for commercialization, but still in a considerable state of consumption.

Internal environmental awareness policies are observed in Food and Nutrition Units. Therefore, Pereira, Santos and Mattos (2020) stated that the population should be encouraged to raise awareness about these problems, delivering information and knowledge about the cause.

4. CONCLUSION

The results showed waste values above that observed in the literature, with special emphasis in relation to the dirty leftovers, revealing a greater need for attention in the planning of meals and in the execution of them, in order to avoid excessive production of food. It is observed that in the tested FNUs, the results are related to those of other units evaluated, thus evidencing that food waste in these institutions is a recurrent situation, alarming the need to define strategies to reduce such indicators.

Among the standards that can be implemented, there is a focus on the management of the FNU ranging from the continued training of employees who prepare and serve food, and campaigns for customers/employees. The initiative and

the establishment of these actions are considered as effective and can be promoted both from public agencies and by the FNU itself.

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