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Nutritional intake of milk, and dairy products consumed by students of the University Ibn Tofail, Morocco

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ABSTRACT

Dairy consumption plays a key role as a food source for human health. This work aims to segment the dairy consumption and assess nutrient intakes of milk among students of the University Ibn Tofail, Kenitra and to estimate the nutritional values of the amount consumed milk. The results showed that the city of student's residence is the main factor of the segregation of students in groups and the students which are resident in the city of Kenitra are those who consume more milk. In contrast, residents in the cities of Sidi Slimane / Sidi Kacem / Sidi Yahia consume less milk and some residents do not consume milk. Pasteurized milk is the preferred milk. Also, for all surveyed student's intake calories, protein, lipid and carbohydrate are lower than the need quantities for the ensuring nutritional balance in the consumer. Also, the consumption of cheese, yogurt and butter remains insufficient in quantity and frequency. However, we noted some quantitative differences in consumption between and within the student residence groups. The profession of the father or head of household is an important factor.

Key words: Dairy products, nutritional value, Students, Kenitra, Morocco

INTRODUCTION

Since the Neolithic, prehistoric period in which began the domestication of certain dairy animals, man began to enjoy the milk of these animals either for its nutrition or as medication for children, the sick and the elderly (Soustre, 2008). At the current state, milk products are found in almost all international trade. In 2014 for example, according to Group Livestock Economics GEB (2015), world dairy trade accounted for the equivalent of 65 million liters in 2014 (excluding intra-EU trade). In addition, milk and dairy products have become essential for any nutritional balance and therefore are one of the main pillars of the global economy. .In the consumer, the products are involved in the satisfaction of his needs more nutritious elements including animal protein, sugar, calcium salt, phosphorus, vitamins (Black, 2003). Moreover, the proteins of milk and dairy products have a value comparable to that of meat protein, fish or eggs, and thanks to their high digestibility and amino acid composition "indispensable" that is particularly well balanced, these milk proteins are of higher quality than plant proteins (Ireland et *al*., (2002). So every day, milk and dairy products take a significant share daily because of the human awareness of potential role of these products in the preservation of the diet balance. However, the rate of availability dairy products in meals varies greatly from country to country, and even the interior of a country according to the degree of urbanization of its compartments (Sraïri and Karbab, 2010). In Europe, for example, individual consumption levels are almost saturated in the North, however in developing countries major; changes are expected (Faye and Alary, 2001). In the South countries, the milk product requirements do not agree with the change in dietary habits towards more diets rich in animal products (Delgado, 2003). As was reported by Sraïri and Karbab (2010) and Speedy (2003), the income of the individual

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or the household head influences strongly the importance of the share of dairy products in meals. Thus, the expected increase in revenues in these regions, induces major changes in food demand, and these are manifested especially for animal products (Speedy, 2003). The issue of structuring the demand for dairy products in African cities still remains poorly studied, because of the many parameters that affect it: income levels, eating habits, gender considerations, offer milk, etc. (Musaiger, 1993).

Furthermore, Moroccans consume more than two million liters of pasteurized milk per day, while consumption of UHT milk is moderate compared to other countries, according to the same data cited by the High Commission for Planning Earlier in Morocco the consumption of milk per person is about 50 liters per year, which makes Morocco far the overall milk consumption rate, which is 90 liters per year (Belkhal, 2004; Anonymous 3, 2009). However, Morocco is progressing on the path of self-sufficiency dairy. In 2014, the country produced 2.3 billion liters, or 90% of its needs. For food safety reasons and in the hope of conquering the African market, the authorities want to reach 4 billion liters in 2020 (Marot, 2015). Inside the country, milk production varies widely from a geographic region to another.

Similarly, studies that are interested in the qualitative and quantitative evaluation of dairy products in the consumer food are almost nonexistent. Indeed, to our knowledge, with the exception of work and Sraïri Karbab (2010) who was interested in this type of evaluation in the city of Rabat, no study is available. Thus, in this work we evaluate at University Ibn Tofail students, Morocco frequency and amount consumed four dairy products: milk, yogurt, butter, cheese.

Materials and Methods

The Faculty of Science is part of the University Ibn Tofail which installs in the city of Kenitra, the main city of the plain of the Gharb. The animal production and the field of livestock provide to the plain a considerable wealth. In effect, the region has a herd of important and diverse. The strength of the herd is estimated to 1528750 heads. The herd of the region is composed of the majority of sheep (73.1%). Cattle and goats in are respectively 24.5% and 2.4%. Cattle at the level of the region constitute 11.2 per cent of the whole of the national herd of cattle. The improved breeds constitute 80.4% of cattle in the region against 58.9 per cent at the national level (Anonymous 1 and 2).

Moreover, the qualitative and quantitative evaluation of dairy products consumed are performed using a survey, which has been distributed in a random manner to 314 students of the University of Ibn Tofail to Kenitra. 58.6% of the participants are women and 41.4% are men. The majority of respondents live in the city Kenitra (71.43%). The remains are divided between Rabat, Salé and others. The survey questionnaire is of type qualitative. The questions concern the frequency and the quantity consumed of certain dairy products (milk, yoghurt, forming, butter). Then, an analysis of the specific modalities according to the type of product consumed has been performed. It is an analysis applied to three qualitative variables or more. It is then a multivariate analysis Conduct from a disjunctive table complete (individuals in lines, variables and modalities in columns). It is to be noted that this last is a presentation of all contingency tables of variables taken two to two and gathered in a single Matrix (Jybaudot, 2014). The analysis is performed by the software IBM SPSS (22). The dependent variable chosen is the place of residence of the individual. For each axis representing milk, yoghurt, butter or cheese the grouping selects the modalities the most cited for each category of the dependent variable.

The calculation of the nutrient intakes of milk are estimated according to the standards cited in ‘‘Santé Canada, 2005’’, such that for a skimmed milk, 250 ml (1 cup) contain: 88 Calories, 8.7 g protein, 12.8 g of carbohydrates and 0.2 g of lipids. Thus, for each individual, from the quantities, consumed per week and the frequency of consumption inputs have been estimated.

RESULTS

Consumption of milk:

In this study, the analysis of modality most cited according to the place of residence of the individual has allowed us to raise the Constitution of 3 distinct groups of the axis "milk" (Table-1). The Group of the city Kenitra (n = 210) understand a majority group of students who consume the milk eight times /week or more and a small group of students which does not consume the milk that with a frequency of one time/week. The pasteurised milk, grace to its availability and its reasonable price, is the preferred milk. The milk powder is consumed once/week with a quantity 1/8 Liter and a preference of two brands that we have symbolised D and E. The profession "teacher" figure frequently as head of the family. The group of cities Rabat/Salé/Khemisset (n = 31); the majority of extras from this group are men. The age of the respondent is between 24-26 years. The milk is consumed with a frequency of 2 to 4 times/week, fresh milk, because of its availability, is the most consumed, the quantity of milk consumed fresh is 1/4 to 1 /2 liter/taking, and that of the milk powder is 1/8 liter with a frequency of once/week, and two marks are preferred (symbolized B and D) and the profession of Father is divided between "other" and soldier. The group of Cities Sidi Slimane/Sidi Kacem/Sidi Yahia) (n = 32) Includes participants who do not consume milk and of individuals who consume 2 to 4 times/week, preferably fresh, with the mark E and the profession of Father is divided among the "other" and "without".

Consumption of yoghurt and cheese:

The analysis of the modalities for the axis allows yoghurt the distinction of three groups (Table-2). The

Table-1. Consumption of milk among students of the university in accordance with the Residence

	City					
	Kenitra (n=210)	**(n;%)**	**Rabat/Salé/ khemissat (n=31)**	**(n;%)**	**Sidi (Slimane/ Kacem/Yahia) (N=32)**	**(n;%)**
Sex						
	-	-	Male	(15; 48.4%)	-	-
Frequency milk consumption						
	More than 8 times/week	(44; 21.0%)	2 to 4 times/week	(14; 45.2%)	2 to 4 times/week	(11; 34.4%)
	1 time/week	(27; 12.9%)	5 to 8 times/week	(11; 35.5%)	Never	(2; 6.3%)
Preference of milk						
	Pasteurized	(133; 63.3%)			The costs	(15; 46.9%)
Reason preferably fresh milk						
	Availability	(65; 31.0%)	Availability	(11; 35.5%)	Reasonable price	(10; 31.3%)
	Reasonable price	(40; 19.0%)	Reasonable price	(5; 16.1%)	Availability	(9; 28.1%)
Quantity consumed by taken fresh milk						
	1/8 liter	(91; 43.3%)	1/4 liter	(8; 25.8%)	1/2 liter	(8; 25.0%)
	1/4 liter	(37; 17.6%)	1/2 liter	(8; 25.8%)	1/4 liter	(5; 15.6%)
Frequency for milk powder						
	1 times/week	(32; 15.2%)	1 times/week	(6; 19.4%)	2 to 4 times/week	(5; 15.6%)
	2 to 4 times/week	(15; 7.1%)	2 to 4 times/week	(2; 6.5%)	More than 8 times/week	(3; 9.4%)
Quantity consumption by making powder milk						
	1/8 liter	(45; 21.4%)	1/8 liter	(10; 32.3%)	1/2 liter	(4; 12.5%)
	1/4 liter	(21; 10.0%)	1/4 liter	(2; 6.5%)	1/8 liter	(4; 12.5%)
Age						
			24 to 26	(6; 19.4%)	From 17 to 19	(13; 40.6%)
					22 to 24	(11; 34.4%)
Mark						
	De	(3; 1.4%)	BD	(6; 19.4%)	E	(8; 25.0%)
	ABDE	(2; 1.0%)	ACDE	(5; 16.1%)	ACDE	(3; 9.4%)
Profession of Father						
	Other	(36; 17.1%)	Other	(6; 19.4%)	Other	(10; 31.3%)
	Professor	(30; 13%)	Soldier	(4; 12.9%)	Without	6; 18.8%)

group of the city Kenitra (n = 210). The age of respondents between 24-26 years. The majority of the participants are men. They consume yoghurt with a cup/taking and the cheese with a frequency of two to three servings/taking. The group of cities Rabat/Salé/Khemisset (n = 31) includes individuals who consume yoghurt two to three cup/taking and cheese a serving to two/taking. The group of cities Sidi Slimane/Sidi Kacem/Sidi Yahia) (n = 32) comprise individuals who consume the yoghurt with a frequency of a cup/taking, the cheese with a frequency of at most a serving/taking, the preferred brand is symbolised E.

Consumption of butter:

The analysis for the axis allows butter the distinction of three groups (Table-3). The group of the city Kenitra / Rabat / Salé / Khemisset (n=241) includes individuals whose quantity consumed of butter is one to two servings/taking and do not consume nutraceuticals. The group of cities Sidi Slimane/Kacem/Yahia) (n=32)

Table-2. Consumption of yoghurt and cheese among students of the university in accordance with the Residence

	City					
	Kenitra (n=210)	**(n;%)**	**Rabat/Salé/ Khemisset (n=31)**	**(n;%)**	**Sidi (Slimane/ Kacem/Yahia) (n=32)**	**(n;%)**
Sex						
	Male	(15; 48.4%)				
Yoghurt frequency						
	2 to 4 times week	(76; 36.2%)	2 to 4 times week	(12; 38.7%)	1 times/week	(10; 31.3%)
	More than 4 times	(59; 28.1%)	More than 4 times	(11; 35.5%)	2 to 4 times week	(10; 31.3%)
Quantity consumed by taken yoghurt						
	A cup	(135;64.3%)	Two cups	(6; 19.4%)	A cup	(17; 53.1%)
			Three cups	(2; 6.5%)	Two cups	(5; 15.6%)
Cheese frequency						
	More than 4 times/week	(98; 46.7%)	2 to 4 times/ Week	(16; 51.6%)	1 times/week	(7; 21.9%)
					Not at All	(4; 12.5%)
Quantity consumed by making cheese						
	A serving	(111;52.9%)	Two servings	(8; 25.8%)	A serving	(14; 43.8%)
	Two servings	(48; 22.9%)	Three servings	(5; 16.1%)	Two servings	(6; 18.8%)
Age						
			24 to 26	(6; 19.4%)	From 17 to 19	(13; 40.6%)
					22 to 24	(11; 34.4%)
Mark						
	DE	(3 ; 1.4%)	BD	(6 ; 19.4%)	E	(8 ; 25.0%)
	ABDE	(2 ; 1.0%)	ACDE	(5 ; 16.1%)	ACDE	(3 ; 9.4%)
Profession of Father						
	Other	(36; 17.1%)	Other	(6; 19.4%)	Other	(10; 31.3%)
	Professor	(30; 14.3%)	Soldier	(4; 12.9%)	Without	(6; 18.8%)

includes individuals whose quantity consumed of butter is one to three servings/taking, not consumption of alicament milk base, not trusted to dairy products and not of consumption of sufficient quantity due to the price that they **located** is not to the scope and the lack of interest in these products and their nutritional roles. The group of Cities "Other" is in majority constituted by men who consume a serving/taking, who consume nutraceuticals milk base, of mark preference B and the profession of father is left in the "other" and trader.

DISCUSSION

According to the results, the student residents to the city of Kenitra, consumes much more dairy products that students residents to other cities, except for butter. Indeed, the majority of students of the University Ibn Tofail residents to this city consume more milk, more cheese and less consumption of butter. This can be explained the difference in purchasing power between the families who live in the city of Kenitra and those who live in the surroundings. This explanation by the

Table-3. Consumption of butter among students of the University Ibn Tofail according to the residence

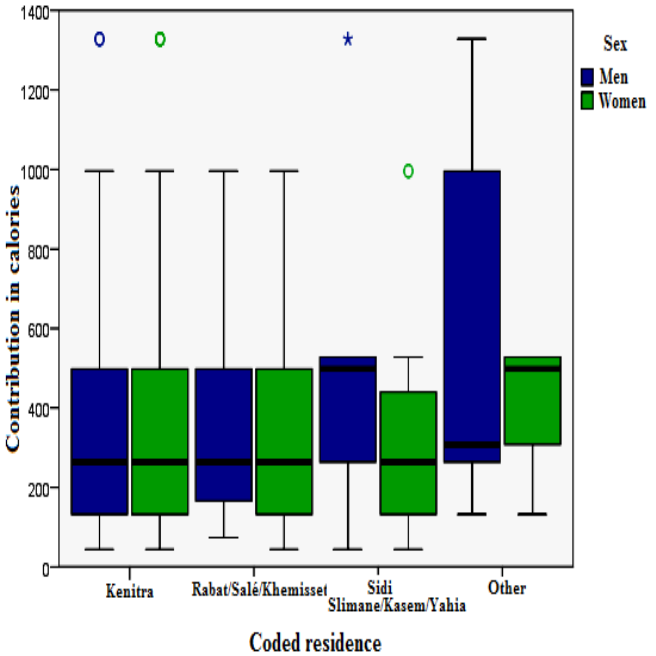
	City							
	Kenitra (n=210)	**(n;%)**	**Rabat/Salé/ Khemisset (n=31)**	**(n;%)**	**Sidi Slimane/Sidi Kacem/Sidi Yahia (n=32)**	**(n;%)**	**Other**	**(n;%)**
Sex								
			Male	(15; 48.4%)			Male	(11; 52.4%)
Butter frequency								
	2 to 4 times/ week more than 4 times/week	(40; 9.0%)	1 times/week	(7; 22.6%)	1 times/week more than 4 times/week	(12; 37.5%) (5; 15.6%)	1 times/ week	(5; 23.8%)
		(34; 6.2%)	Not at All	(6; 19.4%)			2 to 4 times/ Week	(4; 19.0%)
Quantity consumed by making butter								
	A serving	(92 ;43.8%)	A serving	(8; 25.8%) (3; 9.7%)	A serving	(16; 50.0%)	A servin g	(11; 52.4%)
	Two servings	(17; 8.1%)	Two servings		Three servings	(3; 9.4%)		
Alicament milk base								
			Non	(14; 45.2%)	Non	(12; 37.5%)	Yes	(18; 85.7%)
Confidence in the products								
							Non	(14; 66.7%)
Alicament consumption								
			Non	(18; 58.1%)	Non	(16; 50.0%)	Yes	(17; 81.0%)
Purchase of dairy products								
	Epicerie	(128; 61.0%)	Large surfaces	(13; 41.9%)	Among the itinerant walking	(8; 25.0%)	Large surfac es	(7; 33.3%)
			Among the itinerant walking	(4; 12.9%)				
Quantity of dairy products sufficient								
					Non	(16; 50.0%)		

Why in your opinion								
	Price is not to the Focused	(57; 27.1%)	Lack of interest in these products and their nutritional roles	(8; 25.8%)	Price is not to the Focused	(14; 43.8%)	Price is not to the Focused	(6; 28.6%)
	Lack of interest in these products and their nutritional roles	(28; 13.3%)	Price is not to the Focused	(5; 16.1%)	Lack of interest in these products and their nutritional roles	(5; 15.6%)	Non-availability of the products	(2; 9.5%)
Mark								
	DE	(3 ; 1.4%)	BD	(6 ; 19.4%)	E	(8 ; 25.0%)	B	(6 ; 28.6%)
	ABDE	(2 ; 1.0%)	ACDE	(5 ; 16.1%)	ACDE	(3 ; 9.4%)	AB	(3 ; 14.3%)
Profession of Father								
	Other	(36; 17.1%)	Other	(6; 19.4%)	Other	(10; 31.3%)	Other	(5; 23.8%)
	Professor	(30; 14.3%)	Soldier	(4; 12.9%)	Without	(6 ;18.8%)	trader	(4; 19%)

purchasing power has also been suggested by Sraïri and Karbab (2010) in a study carried out to the city of Rabat (Morocco). In addition, an important part of the parents of the students of the city of Kenitra are teachers. Theoretically, the teachers as raise awareness with their children to the importance of consumption of dairy products. By against the cities entitled "Sidi, Slimane, Sidi, Kacem, other" presents less consumption of milk and cheese and more in butter. According to the opinion of the individuals in this group of students, the dairy products are not very available and their price is not to the scope, but the lack of confidence in these products is their main reason. The lack of profession for father or when this is a profession of weak financial performance is also a great reason not to meet its needs in dairy products.

Concerning the importance of dairy products as a source of intake by week in calories, the results show that the average of inputs differs in function of the place of residence of the student. As well this contribution is 384 Calories for students to Kenitra, 362 calories for the student residents in Rabat/Salé/Khemisset, 456 calories for the student residents in Sidi Slimane/Sidi Kacem/Sidi Yahia and 474 calories for residents of other cities. Respectively, the mean daily intakes are calorific 54,85; 51.71; 65,42 and 67,71) (Fig-1). The milk contains a contribution in acids ***trans* fats**. A serving of 250/ml of fresh milk contains approximately 0.2 g of *trans* fat. In Canada, for example, the consumption of *trans* fats in the adult and approximately 8 g /days (Santé Canada, 2005).

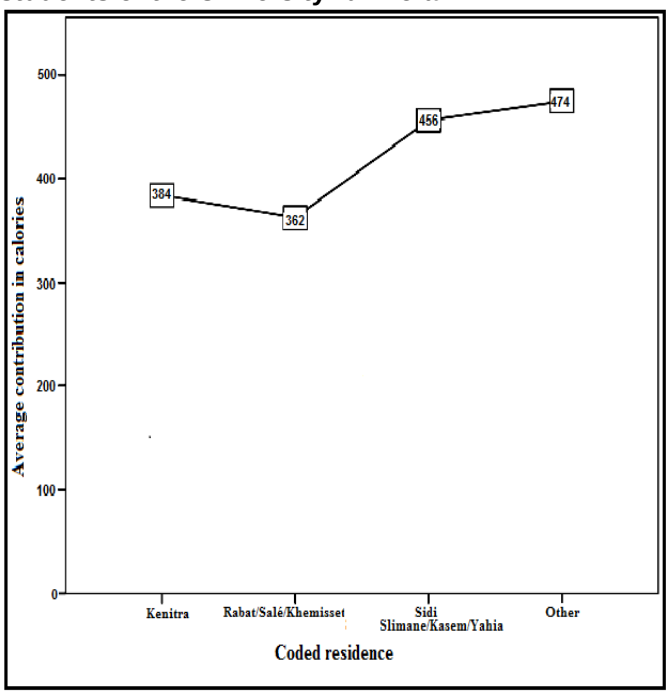
Figure 1 : Weekly average contributions in calories According to the residence of the surveyed



According to the World Health Organization (WHO), the caloric intake should be less than 1% of the quantity of fatty acids consumed daily. Note that the increase in

the consumption of *trans* fat can cause health risks such as the increase of cholesterol and the risk of heart disease.

Figure-2. Calorie intake of milk consumption according to the residence and the sex of the students of the University Ibn Tofail.

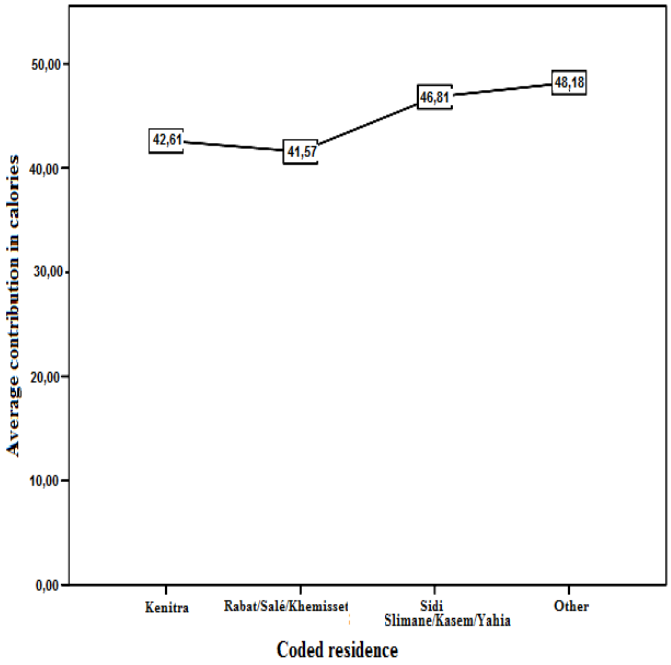


According to the daily intakes the average in calories, the results show the contributions in varies between 50 and 67. For the population studied the calorific intake is, therefore, lower than the value recommended by WHO that 88 calories/day. The results also show that, among the respondents, the daily intakes in Calories does not present a large variation by sex with the exception of students who reside in the group of cities" Sidi Slimane-Sidi Kacem-Sidi Yahia and other "whose line of the media in the Box plot shows a variation with the kind of men. Extreme values, symbolised in figure 2 by small circles and stars vary between 1000 and 1400 calories/week. These extreme values are therefore beyond the daily standard recommended by the WHO (2002), which is 88 calories/day.

For adults, there is not yet a consensus on the optimum quantity of milk to consume in adulthood to prevent osteoporosis and to decrease the incidence of fractures in the elderly (Feskanich et al .,2003; Flynn, 2003; Klompmaker, 2005). However, the butter presents approximately 60% to 65% of fat which may cause slight increases in the rate of HDL cholesterol on the body (Krauss and Kritchevsky, 2000).

The average per week of protein intakes for the student residents to Kenitra is 42,61 g , those of those who reside in Rabat/Salé/Khemisset is 41,57g, those of Sidi Slimane/Sidi Kacem/Sidi Yahia 46,81g and those of other cities 48.81 g. As well, the daily averages for the same groups of cities *respectively are* 6.8 g; 5.9 g; 6.68 g and 6.88g (Fig.3).

Figure 2 : Weekly average of proteins intakes according to the residence of the surveyed



The milk contains the lactoferrin, protein that helps to protect against cancer. Luckily, pasteurisation has no effect on the quantity of milk protein. As well, it is preferable to consume of pasteurised milk (Andersson and Oste, 1995). The average rate per day according to the places of the residences of the students varies between 5.9 g and 6.8 g. These rates are therefore lower than has the value requested by the Canadian standard which 6,8g/day.

The results show that the intake of protein substances does not vary according to sex for the student residents to Kenitra. Unlike this type of variation is noted sex of the student the variation by sex in the protein intakes among residents of other cities. Similarly, as the heat inputs, the protein intakes are of extreme values (rounded form and star in figure 4), which vary between 100 g/weeks and 140 g/week. It should be noted that an important consumption of protein could be associated with an increase in loss of calcium by urinary track, resulting in a reduction in bone mass or an increase in fractures (Lanou et al ., 2005).

The results also show that the students of male sex in the group of cities symbolised "other" men of the city "Other" presents a great variation in the protein intake (Fig.4). Lactose is the main carbohydrate to milk which encourages the assimilation of dairy proteins and optimises the proper use of the dairy calcium by the body by increasing its absorption at the level of the intestine. The milk of cow in contains approximately 5% and that of women 7 % and the yoghurt can happen up to 6%. The average daily nutrient intake level in carbohydrates to meet nutrient needs in 97 to 98% of the individuals in good health is of 130 g for adults aged

18-50 years (Anonymous, 2006). In the context of this study, the students surveyed belongs to this age category and has a contribution average 60,70g of carbohydrates/week among students who reside in Kenitra, 61.16 g among residents in the group of cities Rabat/Salé/Khemisset, 68,88g of the residents of Sidi Slimane/ Sidi Kacem/ Sidi Yahia and 70.89 g among residents of other cities. Thus, for individuals in the cities or group of cities cited, the average intakes daily labourers are respectively is 8.6 g; 8.7 g; 9.84 g and 10, 12 g (Fig.5). As well, these daily intakes in carbohydrates that come from the milk remain insufficient as a food source.

Figure-4. Proteins intake of milk consumption according to the residence and the gender among the students of the University Ibn Tofail.

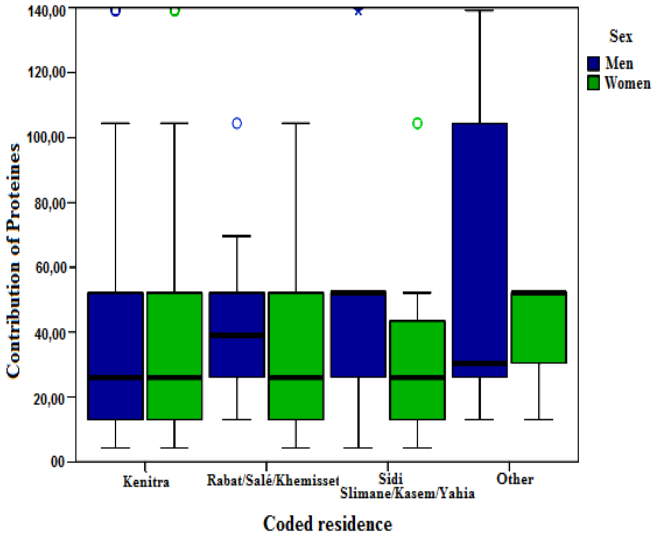
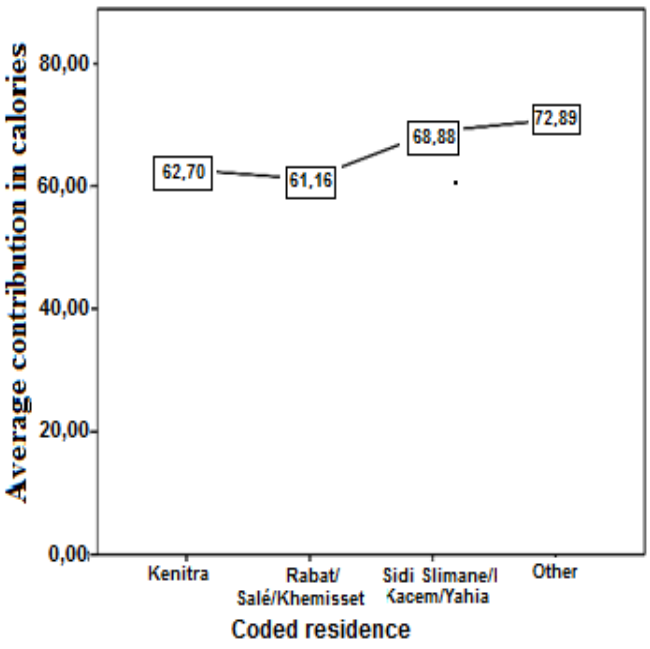


Figure-5. Weekly average of carbohydrate intakes according to the residence of the surveyed



The results also show that the residents of the city of Kenitra, as in the case of protein intakes, the carbohydrate intakes do not vary by sex. While type of variation exists among individuals resident in other cities. Extremes values inputs in carbohydrates are reported (in the form rounded and star) in Figure-6 vary between 150 g and 250 g/weeks of carbohydrate/week.

Figure-6. Carbohydrates intake of milk consumption according to the residence and the gender among the students of the University Ibn Tofail.

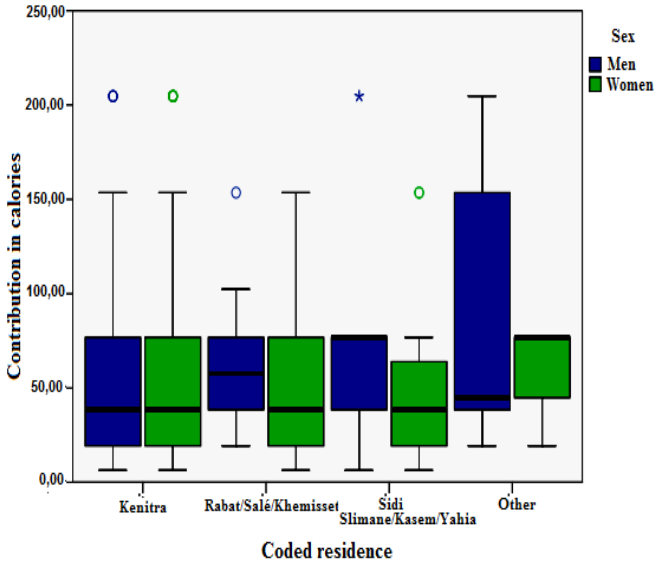
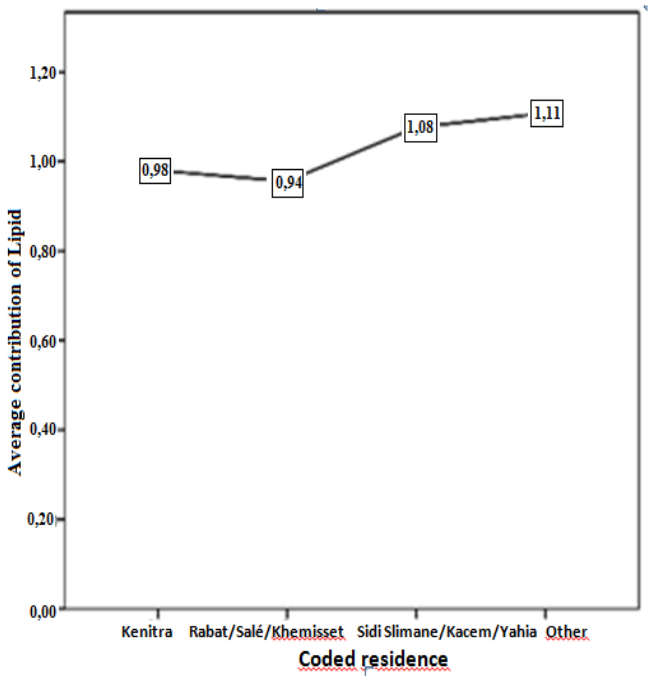


Figure-7. Weekly average of intake lipids according to the residence of the surveyed

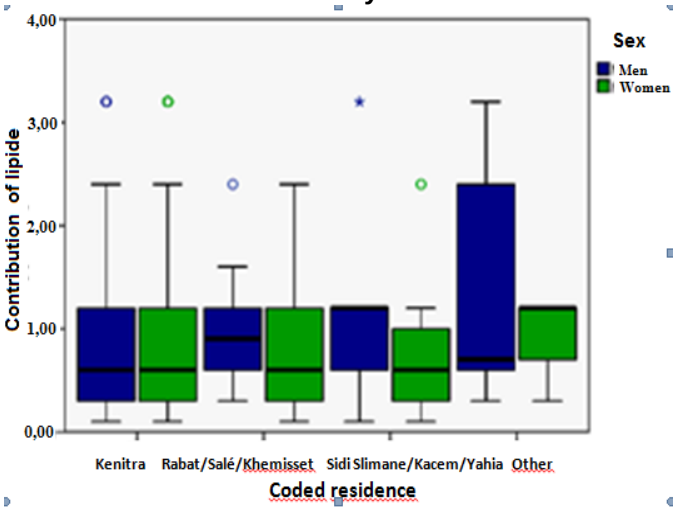


The milk contains the fat which is composed of 99.5% of lipids and 0.5% other fat-soluble substances.

The results show that the average per week of lipid intakes among students residents to Kenitra is 60,70g, the group of city Rabat/Salé/Khemisset is 61.16 g, the group Sidi Slimane/ Sidi Kacem/Sidi Yahia is 68,88g and that of other cities is 70.89 g. As well, the average intakes per day for the same cities or group of cities are *respectively* is 0.98 g; 0.96 g; 1.08 g and 1.11 g (Fig.7). These daily rates of lipids remain insufficient in based on the quantities consumed of milk as a food source.

Note that even among individuals who reside in Kenitra, there is no variation of fat intake by sex. Unlike this type of variation is present among students resident in other cities. Extremes values of intake of lipid (Fig.6) are noted and vary between 2,4G and 3,3g of lipids/week.

Figure-8. Lipids intake of consumption of milk according to the residence and the gender among the students of the University Ibn Tofail.



The milk Cru presents 37% of poisonings, dairy products and fermented products (24%), and forming (8%) (Hamama et al., 1992). In effect, Benkerroum and *al*. (2004) have reported that approximately 9.1% of the products of the dairy products sold at the level of the city of Rabat (Morocco), Contain *E. coli*. However, despite the adverse effects of raw milk, it is recommended to consume 1000 mg to 1300 mg of calcium per day according to the age, which is equivalent to two or three servings of dairy products.

CONCLUSION

For the entire study population, consumption of milk and dairy products remains inadequate as a source of calories, protein, carbohydrates and fats necessary for good nutritional balance in the body. Among the causes of this low consumption of dairy products, the prices are not in the scope, lack of interest in these products and its nutritional values and a non-confidence in domestic products. Furthermore, we have identified four consumer groups of dairy products distinct by the quantity and frequency of consumption of these products. Each group is characterized by the place of residence of its individuals. So student's residents of the city of Kenitra consume more milk in relation to residents in the towns of Sidi Slimane / Sidi Kacem / Sidi Yahia. Pasteurized milk is the preferred milk. Furthermore, the results show that the consumption of cheese, yogurt and butter remains insufficient in quantity and frequency. Also note that there is quantitative difference in consumption between and within the student residence groups. The profession of the father or head of household, is an important factor.

Conflict of Interests

Authors declare that there is no conflict of interests regarding the publication of this paper.

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