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Assessment of Dietary Habits and Sociodemographic Profiles in the Rabat-Salé-Kénitra Region

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ABSTRACT

Background: A healthy and varied diet plays a fundamental role in supporting balanced physical development, maintaining overall health, and mitigating the risk of chronic diseases. Understanding dietary habits is essential for designing effective interventions and promoting nutritional well-being. This study investigates the dietary habits of individuals in the Rabat-Salé-Kénitra region, with a focus on sociodemographic and anthropometric characteristics, meal consumption patterns and food choices. The findings aim to highlight gender-specific trends and general dietary behaviors within the population.

Methods: A prospective cross-sectional observational study design was employed to evaluate dietary habits. Data were collected using a structured questionnaire in two phases: the first phase focused on sociodemographic and anthropometric information, while the second captured detailed dietary habits. A total of 1,012 participants were recruited, comprising 60.4% females and 39.6% males. Statistical analyses were conducted using SPSS software (version 22) and Chi-square tests were applied to identify significant relationships between variables. Body Mass Index (BMI) categories were calculated and dietary habits were analyzed by gender.

Result: The study population was predominantly female (60.4%) and included a higher proportion of younger individuals, with 45.4% aged 18-30 years. Most participants (85.9%) had university-level education and civil servants represented the largest professional group (52.9%). Females were overrepresented among unemployed participants, while married individuals comprised the majority (54.8%) of family statuses. BMI analysis indicated that overweight and obesity were more prevalent among females, whereas males dominated the underweight category ($p = 0.0005$). Regarding dietary habits, 53.6% of participants consumed four meals daily, with 80.7% consuming bread and pastries daily and 60.2% consuming fruits and vegetables 4-5 times weekly. Frequent consumption of meat and poultry was observed, with females showing higher intake levels. No significant gender differences were found in fish/seafood, cereals, or dairy product consumption and snack and sweet product consumption patterns were consistent across genders.

Key words: Body mass index (BMI), Dietary habits, Gender differences, Rabat-salé-kénitra region, Sociodemographic characteristics.

INTRODUCTION

Adapted and balanced nutrition that meets the needs of the body accompanied by regular physical activity helps maintain good health (WHO) (Organization, 2003).

Food plays a central role in societal concerns, with its strong link to health long established. National programs like the PNNS promote healthy diets and physical activity (Hercberg 2011; Lecerf, 2018). Epidemiological studies confirm the relationship between diet and health globally (O'Neil *et al*., 2014). However, food choices are shaped by economic, cultural, and social factors (Fieldhouse, 2013). Industrialization and globalization have improved living standards but led to unhealthy lifestyles, disproportionately affecting disadvantaged groups and increasing chronic diseases like obesity, diabetes and cardiovascular conditions (Organization, 2003; Gowshall and Taylor-Robinson, 2018). Non-communicable diseases (NCDs) account for 71% of global deaths, including 15 million premature deaths annually (Perico and Remuzzi, 2012). Nutrition knowledge significantly influences dietary decisions and prevents NCDs (Penzavecchia *et al*., 2022; Albrahim *et al.,* 2023). Adopting healthy lifestyles and balanced diets can mitigate NCD risks and improve global health (Passi, 2017; Pandey *et al.,* 2021).

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Also comprehensive knowledge of nutrition is crucial for individuals to be able to understand and meet their nutritional requirements, allowing them to make

informed food choices (Truman *et al.,* 2017; Bany-yasin *et al.,* 2023).

In Morocco, demographic transition and epidemiological transition are generally associated with changes in lifestyle, including eating habits and physical activity levels (Aboussaleh and Sbaibi, 2015). This transition results in a significant increase in the prevalence of non-communicable diseases (NCDs), including cancer, diabetes, cardiovascular disease, chronic respiratory disease and chronic kidney failure. NCDs are the leading cause of death, estimated at 80% according to the WHO, with an estimated 12% premature mortality. This statistic exceeds the global average of 70% of deaths attributed to NCDs, placing Morocco among the countries of the Eastern Mediterranean region with a high mortality due to these diseases (Africa and Asia, 2018). In the same context, malnutrition is a major public health concern, manifested by a relative or absolute deficit or excess of one or more essential nutrients (WHO)(Azandjeme *et al.,* 2020). Malnutrition from nutrient deficiency, particularly micronutrients such as iron and vitamin A, poses a significant public health challenge, especially in developing countries (Peterson *et al.,* 2016).

Consequently, micronutrient deficiencies represent a significant public health issue, with serious consequences, particularly for vulnerable groups such as pregnant and lactating women, adolescent girls, infants and young children (Reyes Matos *et al.,* 2020). Therefore severe and persistent nutritional deficiency can lead to deficiency disorders, such as goiter (hypertrophy of the thyroid gland due to lack of iodine), rickets (bone deformity due to vitamin D deficiency), or pernicious anemia (a form of anemia accompanied by neurological disorders due to vitamin B12 deficiency) (Knobel, 2016). Globally, iodine deficiency affects more than 700 million people, largely in the least developed countries (WHO/UNICEF/International Council for the Fight against Iodine Deficiency Disorders. Progress towards the elimination of iodine deficiency disorders (Organization 2014). In addition, more than 2 billion people suffer from iron deficiency anemia (WHO/UNICEF/UN University. Evaluation, prevention and control of iron deficiency anemia: a guide for program managers (Denno and Paul, 2017).

Vitamin A deficiency remains the leading cause of preventable and unjustified blindness in children, as well as an increased risk factor for premature infant mortality due to infectious diseases; it affects approximately 250 million children under five years of age in a subclinical form (WHO/UNICEF)(West and Darnton-Hill, 2008). So diet and nutrition play an essential role in maintaining good health throughout life. Their influence as key factors in the development of chronic non-communicable diseases is well established which places them at the forefront of prevention (Di Renzo *et al.,* 2015).

The study examines key concerns regarding dietary habits in the Rabat-Salé-Kénitra region. It highlights a dietary imbalance, with a carbohydrate-dominant diet and insufficient protein and vitamin intake. Health implications include the potential impact of these patterns on BMI and overall health, given low consumption of essential food groups like fish and dairy.

MATERIALS AND METHODS

Study area

Rabat-Salé-Kenitra is a region located in the northwestern part of Morocco. The region is situated between the longitude 5°37′W and 7°34′W and latitude 33°08′N and 35°03′N (Fig 1). It is one of the twelve regions of Morocco since the territorial division of 2015 with total area of 18

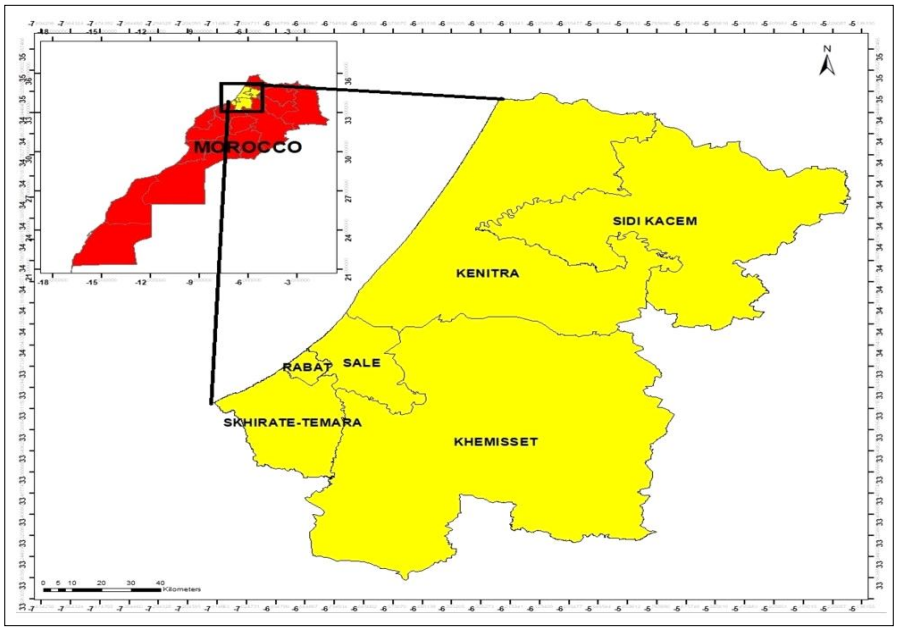


Fig 1: Study area.

194 km^2, it is supervised by several regions of Morocco: it shares its limits in the north with the region of Tanger-Tetouan-Al Hoceima, in the east with the region of Fès-Meknès, in the south with the regions of BeniMellal-Khénifra and Casablanca-Settat and in the west, it is bordered by the Atlantic Ocean, the number of municipalities is 114 including 23 urban and 91 rural. Based on 2014 Census of Population data, the region had a total population of 4,580,866 (El Hachlafi *et al.,* 2020; Berred *et al.,* 2022; Loulad *et al.,* 2023).

Study samples

The study included participants aged 18+ from the Rabat-Salé-Kenitra region, using a two-part questionnaire. The first part collected socio-demographic data, while the second focused on food supplement (FS) consumption, including frequency, duration, reasons, components, forms, and purchase locations. Non-consumers were excluded. Conducted as a cross-sectional prospective study, data collection spanned February 2021 to January 2022 *via* an anonymous Google Drive questionnaire and within a subsidiary of DAXEN Morocco (NaturAloé) located in the province of Kénitra over a period of 11 months. Statistical analysis was performed using SPSS 22, with results presented in graphs and an Excel database.

RESULTS AND DISCUSSION

Sociodemographic and anthropometric characteristics

The sociodemographic and anthropometric characteristics of the participants are analyzed with a focus on gender, age, education level, employment status, and family situation.

Table 1 presents the age distribution by gender among 1,012 participants (60.4% females, 39.6% males). Participants were categorized into four age groups: 18-30 years, 31-40 years, 41-50 years and over 50 years. The largest group was 18-30 years, comprising 45.4% of participants (283 females and 176 males), followed by the 31-40 group with 37.1% (194 females and 181 males). The 41-50 group accounted for 9.3% (64 females and 30 males), while the over 50 group, the smallest cohort, made up 8.3% (70 females and 14 males). Females consistently outnumbered males across all age groups, with the gender gap particularly pronounced among participants over 50 years old. The predominance of younger participants, especially in the 18-30 group, suggests a demographic bias, and male participation declined notably in older age groups. The Chi-square test (χ^2 = 32.863, p = 0.0005) confirmed a statistically significant difference in age distribution between genders.

Table 1 summarizes data from 1,012 participants (60.4% females, 39.6% males) distributed across age, education, profession, and family status. Age groups included 18-30 (45.4%), 31-40 (37.1%), 41-50 (9.3%) and over 50 (8.3%) years, with females consistently outnumbering males, particularly in the over-50 category. The Chi-square test (χ^2 = 32.863, p = 0.0005) revealed significant gender differences in age distribution. Educational attainment showed most participants (85.9%) had university education, followed by secondary (12.8%) and primary education (1.3%). A Chi-square test (p = 0.379) indicated no significant gender differences in education levels. Professionally, civil servants dominated (52.9%), followed by self-employed (20.7%), students (14.3%) and unemployed (12.2%). The unemployed group was exclusively female. Gender differences in professional status were significant (p = 0.0005). Regarding family status, singles constituted 41.3%, married participants 54.8% and divorced individuals 3.9%. The Chi-square test (p = 0.982) found no significant gender differences in family status.

BMI group

Table *2* showed the percentage of the different BMI groups distributed by the sexes, providing a clear overview of the body composition of the study population. Out of a total of 1,012 participants, 60.4% were females (611 participants) and 39.6% were males (401 participants). Participants were grouped into six BMI categories: underweight, normal weight, overweight and three obesity classes.

The underweight category (BMI < 18.5) accounts for 5.2% of the total participants (52 individuals), with 18 females (1.8%) and 34 males (3.4%), showing higher representation among males. The normal weight category (18.5≤ BMI ≤ 24.9) is the largest, comprising 38.9% of the participants (394 individuals), with 203 females (20.1%) and 191 males (18.9%), indicating near-equal gender distribution. In the overweight category (25 ≤ BMI ≤ 29.9), 30.6% of the participants (310 individuals) were included, with a higher proportion of 207 females (20.5%) compared to 103 males (10.2%). The Obesity Class I (30 ≤ BMI ≤ 34.9) represents 15.6% of participants (158 individuals), consisting of 98 females (9.7%) and 60 males (5.9%). In Obesity Class II (35 ≤ BMI ≤ 39.9), 7.5% of participants (76 individuals) are represented, including 66 females (6.5%) and 10 males (1.0%), with a strong dominance of females. Finally, Obesity Class III (BMI > 40) is the smallest category, accounting for 2.2% of participants (22 individuals), with 19 females (1.9%) and only 3 males (0.3%).

The Chi-square test produced a P-value of 0.0005, indicating a statistically significant relationship between gender and BMI distribution at the 0.05 level.

Frequency of food consumption in both gander

Table 3 examines the eating habits of 1,012 participants (60.4% women, 39.6% men). Substantial meals were most common on weekends, with Saturday (31.6%) and Sunday (27.8%) preferred, particularly among women (Saturday: 19.4%, Sunday: 16.1%) compared to men (Saturday: 12.3%, Sunday: 11.7%). Weekdays like Tuesday (2.0%) and Thursday (1.3%) showed lower proportions. The Chi-square test (p = 0.163) found no significant gender differences in meal timing.

Regarding meal frequency, 53.6% ate four meals daily, followed by three (19.6%) and two (18.5%) meals, with no

significant gender variation (p = 0.053). Daily bread or pastry consumption was reported by 80.7%, equally across genders (p>0.05). Fruits and vegetables were consumed 4-5 times weekly by 60.2% and daily by 23.0%, with no gender differences (p = 0.543), this result differs slightly from that reported in a study conducted in the Arwal district of Bihar, where 87.01% of participants stated that they consumed green vegetables every day (Krishnasree *et al.,* 2018; Sharma 2022) However, meat and poultry consumption (4-5 times weekly) showed significant differences (p= 0.0005), with women consuming more (31.6% vs. 13.9%). Other categories showed no significant differences. Overall, eating habits were largely similar between genders, with minor variations in specific categories.

This aligns with Morocco's cereal-centric food culture, where bread, often paired with Tagine, replaces traditional grains like barley. Meanwhile, couscous consumption declines, while pasta rises (TOBBA Tassabih, 2023). The Moroccan Nutritional Transition study highlighted the fact that the Moroccan diet has changed considerably, with an increase

Table 1: Distribution of Sociodemographic and anthropometric characteristics.

			Gender		Total
			Female	Male	
Age	18-30 years	Effective	283	176	459
		% of total	28.0%	17.4%	45.4%
	31-40 years	Effective	194	181	375
		% of total	19.2%	17.9%	37.1%
	41-50 years	Effective	64	30	94
		% of total	6.3%	3.0%	9.3%
	over 50 years	Effective	70	14	84
		% of total	6.9%	1.4%	8.3%
			Gender		**Total**	**Chi-square test P valu**
			Female	**Male**		
Education levels	Primary	Effective	6	7	13	1.940
		% of total	0.6%	0.7%	1.3%	P=0.379
	Secondary	Effective	74	56	130	
		% of total	7.3%	5.5%	12.8%	
	University	Effective	531	338	869	
		% of total	52.5%	33.4%	85.9%	
			Gender		**Total**	**Tests du Khi-deux P valu**
			Female	**Male**		
Professional status	Student	Effective	82	63	145	96.132
		% of total	8.1%	6.2%	14.3%	P=0.0005
	Civil servant	Effective	304	231	535	
		% of total	30.0%	22.8%	52.9%	
	Self-employed	Effective	102	107	209	
		% of total	10.1%	10.6%	20.7%	
	Unemployed	Effective	123	0	123	
		% of total	12.2%	0.0%	12.2%	
			Gender		**Total**	**Tests du Khi-deux P valu**
			Woman	**Man**		
Family status	Single	Effective	253	165	418	0.036
		Effective	25.0%	16.3%	41.3%	P=0.982
	Married	% of total	335	220	555	
		Effective	33.1%	21.7%	54.8%	
	Divorced	Effective	23	16	39	
		% of total	2.3%	1.6%	3.9%	
Total		Effective	611	401	1012	
		% of total	60.4%	39.6%	100.0%	

in the consumption of animal products, while that of cereals and sugar has remained relatively high, underlining the specificity of Moroccan eating habits (Benjelloun, 2002).

Fruits and vegetables are consumed 4-5 times weekly by 83.2% of Moroccans, but daily intake averages one fruit and 2.5 vegetable servings, below the recommended 400-500 g for cardiovascular health (Organization, 2003). Meat and poultry consumption, mainly 2-5 times weekly, reflects dietary preferences like mutton, despite rising concerns about antibiotic resistance and contamination in poultry products (Fazza *et al*., 2023; Cohen *et al*., 2007). Morocco's nutritional transition shows increased animal product intake alongside under-nutrition in children and growing adult obesity (Benjelloun, 2002). Compared to France, where meat ranks second, Moroccans prioritize cereals and vegetables (Sharma, 2021). A study conducted in Hyderabad shows that chicken is the preferred meat, while mutton is less favored, and pork and beef are consumed occasionally due to taboos and religious beliefs, with average consumption levels falling below recommended dietary guidelines (Ankur Ojha *et al.,* 2015; Krishnasree *et al.,* 2018; Sharma, 2022).

Traditional Moroccan dairy products like *lben*, *smen*, and *jben* are vital in rural diets and increasingly marketed informally (Cuvelier *et al*., 2004). Goat's milk is primarily processed into cheese due to sensory preferences ((EFFICACE, 2021). These dairy products may protect against colorectal cancer (Kaoutar *et al.,* 2019). Among legumes, peas, lentils, white beans and broad beans are the most common. A study analyzed these products for energy, water, protein, fat, total carbohydrates, total ash and 15 minerals, revealing that the energy value of Moroccan foods is higher than that reported in the FAO table for Africa (FAO *et al.,* 2017). Morocco is the leading North African country in terms of cereal production. However, little of this biomass is used for energy production in the country, representing a major challenge due to heavy dependence on energy imports, limited water resources and a rapidly growing population (Mahdavi *et al.,* 2023). One study explored how the cognitive representation of a food as a "snack" or "meal" influences eating behavior. Foods such as potato chips, crackers, cookies and nuts are seen as snacks, while soups, burritos, pizzas and pancakes are seen as meals (Wadhera and Capaldi, 2012). Dans notre étude la majorité des individus de l'échantillon étudié (67,1%) consomment les aliments type snack (Pizza, Paninis, Hamburgers, Tacos…) d'une fréquence faible qui est d'une seule fois par semaine ce qui est compatible aux habitudes des français, selon (Le snacking en France) 57% fréquentent au moins une fois dans la semaine (Forbes *et al.,* 2016). (including weekends). In contrast to America, almost three quarters of survey respondents (73%) reported consuming snacks at least once a day. Specifically, 34% reported snacking once a day, 25% twice and 14% three or more times, demonstrating that snacking is an integral part of the daily diet of many in the American population (Wadhera and Capaldi, 2012). One study found that high consumption of fast food and industrial baked goods may be associated with an increased risk of depression. The authors recommend limiting consumption of these foods in favor of healthier options (Gougeon, 2014).

This consumption is similar to that observed in a study conducted among 100 subjects in Hisar city of Haryana state, where the intake of pulses was found to be adequate at 69% and 57% of the recommended intake, respectively (Budhwar and Jood, 2010). Snacking, primarily weekly, aligns with French trends (Forbes *et al.,* 2016) but contrasts with frequent American habits (Wadhera and Capaldi, 2012). High fast-food consumption may increase depression risk, highlighting the need for healthier choices (Gougeon, 2014).

Table 2: Distribution of BMI groups by gander.

			Grander		Total	Chi-square
			Female	Male		test
Groupe BMI	BMI <18.5	Effective	18	34	52	61.279
		% of total	1.8%	3.4%	5.2%	P= 0.0005
	18.5< BMI >24.9	Effective	203	191	394	
		% of total	20.1%	18.9%	38.9%	
	25< BMI >29.9	Effective	207	103	310	
		% of total	20.5%	10.2%	30.6%	
	30< BMI >34.9	Effective	98	60	158	
		% of total	9.7%	5.9%	15.6%	
	35< BMI >39.9	Effective	66	10	76	
		% of total	6.5%	1.0%	7.5%	
	BMI >40	Effective	19	3	22	
		% of total	1.9%	0.3%	2.2%	
Total	Effective	611	401	1012		
	% of total	60.4%	39.6%	100.0%		

Table 3: Frequency of food consumption in both gander.

			Sex		Total	Chi-square test
			Female	Male		
Meal consequences	Monday	Effective	21	28	49	10.488
		% of total	2.1%	2.8%	4.8%	P= 0.163
	Thursday	Effective	11	9	20	
		% of total	1.1%	0.9%	2.0%	
	Wednesday	Effective	12	5	17	
		% of total	1.2%	0.5%	1.7%	
	Tuesday	Effective	7	6	13	
		% of total	0.7%	0.6%	1.3%	
	Friday	Effective	105	60	165	
		% of total	10.4%	5.9%	16.3%	
	Saturday	Effective	196	124	320	
		% of total	19.4%	12.3%	31.6%	
	Sunday	Effective	163	118	281	
		% of total	16.1%	11.7%	27.8%	
	Aucun	Effective	96	51	147	
		% of total	9.5%	5.0%	14.5%	
Number of meals per day	1	Effective	18	10	28	9.354
		% of total	1.8%	1.0%	2.8%	P= 0.053
	2	Effective	118	69	187	
		% of total	11.7%	6.8%	18.5%	
	3	Effective	112	86	198	
		% of total	11.1%	8.5%	19.6%	
	4	Effective	338	204	542	
		% of total	33.4%	20.2%	53.6%	
	5	Effective	25	32	57	
		% of total	2.5%	3.2%	5.6%	
Consumption of bread/wholemeal bread and pastries	Never	Effective	14	7	21	0. 609
		%	2.3%	1.7%	2.1%	P= 0.894
	2-3 times per week	Effective	47	34	81	
		%	7.7%	8.5%	8.0%	
	4-5 times per week	Effective	55	38	93	
		%	9.0%	9.5%	9.2%	
	Daily	Effective	495	322	817	
		%	81.0%	80.3%	80.7%	
Consumption of Fruit and vegetable	Never	Effective	20	9	29	2.145
		%	2.0%	0.9%	2.9%	P= 0.543
	2-3 times per week	Effective	85	56	141	
		%	8.4%	5.5%	13.9%	
	4-5 times per week	Effective	373	236	609	
		%	36.9%	23.3%	60.2%	
	Daily	Effective	133	100	233	
		%	13.1%	9.9%	23.0%	
Consumption of meat and poultry	Never	Effective	40	46	86	32.480
		%	4.0%	4.5%	8.5%	P= 0.0005
	2-3 times per week	Effective	51	54	105	
		%	5.0%	5.3%	10.4%	
	4-5 times per week	Effective	192	152	344	
		%	19.0%	15.0%	34.0%	
	Daily	Effective	320	141	461	

Table 3: Continue....

Table 3: Continue....

		%	31.6%	13.9%	45.6%	
	Never	Effective	8	8	16	
		%	0.8%	0.8%	1.6%	
Consumption of	Never	Effective	26	13	39	0.676
fish and seafood		%	2.6%	1.3%	3.9%	P= 0.713
	1 times per week	Effective	503	333	836	
		%	49.7%	32.9%	82.6%	
	2-3 times per week	Effective	82	55	137	
		%	8.1%	5.4%	13.5%	
	Never	Effective	55	27	82	7.079
		%	5.4%	2.7%	8.1%	P= 0.132
Consumption of Cereals	2-3 times per week	Effective	146	108	254	
(pasta, rice, *etc*.) and		%	14.4%	10.7%	25.1%	
legumes (white beans,	4-5 times per week	Effective	295	194	489	
chickpeas, lentils		%	29.2%	19.2%	48,3%	
	Daily	Effective	23	6	29	
		%	2.3%	0.6%	2.9%	
	Never	Effective	92	66	158	
		%	9.1%	6.5%	15.6%	
	Never	Effective	24	17	41	1.825
		%	2.4%	1.7%	4.1%	P= 0.768
Produits sucrés	2-3 times per week	Effective	15	12	27	
(chocolats, confiseries,		%	1.5%	1.2%	2.7%	
gâteaux, biscuits	4-5 times per week	Effective	43	28	71	
sucrés, pâtisseries)		%	4.2%	2.8%	7.0%	
	Daily	Effective	233	166	399	
		%	23.0%	16.4%	39.4%	
	Never	Effective	296	178	474	
		%	29.2%	17.6%	46.8%	
	Never	Effective	17	19	36	3.107
		%	1.7%	1.9%	3.6%	P= 0.540
Consumption of	2-3 times per week	Effective	411	268	679	
Snack foods (Pizza,		%	40.6%	26.5%	67.1%	
Paninis, Hamburgers,	4-5 times per week	Effective	143	90	233	
Tacos, *etc*.)		%	14.1%	8.9%	23.0%	
	Daily	Effective	38	22	60	
		%	3.8%	2.2%	5.9%	
	Never	Effective	2	2	4	
		%	0.2%	0.2%	0.4%	

CONCLUSION

This study analyzed dietary habits in Rabat-Salé-Kénitra, revealing a young, educated population. Bread was the most consumed food, followed by fruits, vegetables and meat. Dairy was moderately consumed, while fish, legumes and snacks were less frequent. No significant gender differences were found, highlighting a diet leaning towards carbohydrates over proteins.

Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarilyrepresent the views of their affiliated institutions. The authors are responsible for the accuracy andcompleteness of the information provided, but do not accept any liability for any direct or indirect lossesresulting from the use of this content.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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