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Research Article

Study of the Practice of Consumption of Vitamin C in Morocco: Results of an Observational Cross-Sectional Survey of Pharmacies and General Public

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Abstract

Vitamin C is a fundamental micronutrient having a primordial role in several biological functions including in the immune defense, the fight against oxidation, the normal formation of collagen, the digestive absorption of iron. In order to appreciate the habits of the consumption of this vitamin with of the Moroccan population, a cross-sectional observational study was carried out. It was conducted on a representative sample of pharmacy customers in Morocco, with an objective to collect information on their consumption habits and compare them to the nutritional recommendations in place.

The questionnaire is divided into two parts:

- The first part, of public order, focused on sociodemographic characteristics, on the level of knowledge relative to vitamin C, dietary habits linked to its natural sources and on supplementation.
- The second part, addressed to pharmacists, to capture their opinion on the demand for vitamin C, their dispensing habits, and their knowledge about ignorance of patients on this subject.

The preliminary results provided a comprehensive overview of vitamin C consumption, revealing significant gaps between actual intakes and estimated needs. This survey highlighted the need for better nutritional education of the population and more active involvement of health professionals, particularly pharmacists, in promoting adequate consumption of this vitamin within the population.

Keywords: *Vitamin C; Acid Ascorbic; Effect Therapeutic; Supplementation*

Introduction

Covid-19 health crisis, interest in vitamin C has grown due to its widespread use in self-medication in the climate of collective psychosis created by the pandemic. Having become ubiquitous in pharmaceutical, food, and cosmetic products. It is a key factor in the prevention and management of various diseases, opening new avenues of research. Vitamin C has long been unknown to the general public, it is now

widely prescribed in pharmacies to combat fatigue, increase energy and maintain nutritional balance and it is also frequently prescribed in general medicine in advice for diagnosis and prevention of deficiencies [1]. It is one of the best-selling food supplements.

Vitamin C, an essential water-soluble vitamin, cannot be synthesized by the body and must therefore be provided by food, particularly fruits and vegetables (citrus fruits, leafy vegetables, berries, potatoes). A varied diet is therefore essential to cover daily needs and avoid certain illnesses, while promoting better overall health and increased longevity [2]. A vitamin C deficiency leads to various disorders: epidemics, infections, poor healing, degeneration of connective tissues, and even scurvy, a very serious disease often diagnosed late but which can be prevented [3].

Objective of the Work

This work aims to determine through a questionnaire the nutritional contribution of vitamin C and its supplementation among the Moroccan population and to evaluate the attitude of pharmacy professionals when dispensing this product.

Materials and Methods

This work used cross-sectional and observational survey methods, carried out by an anonymous closed electronic questionnaire using Google Forms. The survey questionnaire consisted of two distinct parts: the first part was intended for the general Moroccan population and included socio-demographic criteria, as well as questions aimed at assessing knowledge about vitamin C, dietary habits related to the consumption of foods rich in vitamin C, as well as the use of supplements. The second part was specifically designed for pharmacists and included closed, open and semi-open questions.

General public survey

- **Type of study:** This is a cross-sectional observational survey with an evaluative aim to conduct our retrospective study.
- **People surveyed:** The population surveyed was the Moroccan population residing in Morocco. The Moroccan population not residing in Morocco is excluded from our study.
- **Duration of the study:** Our study lasted for a period of 2 months.
- **Data collection:** Data are collected from the responses to the questionnaires which were carried out using Google Forms and shared via emails and the WhatsApp social network. Participants were only allowed to complete the form once.
- **Ethical considerations:** Participation in our study was anonymous, voluntary and in complete transparency with the participants.

Investigation pharmacy

- **Kind of the study:** It is a cross-sectional observational survey with an evaluative aim to conduct our retrospective study.
- **People surveyed:** During this study, the target was pharmacists, assistant/replacement pharmacists, pharmacy students/thesis students (on pharmacy internship) and pharmacist assistants. Industrial and hospital pharmacists and those working abroad are excluded.
- **Duration of the study:** The period of our study lasted over a period of 2 months.
- **Collection of data:** After consent from the participants, data collection was carried out either by going directly in pharmacies, or by electronically sending the questionnaire by email. For pharmacists not met in person, the objectives of the study were specified in the header of the form. This collection encountered several difficulties, notably linked to the constraint of travel and a low response rate when physically submitting the questionnaires, leading to favoring distribution by email and using platforms dedicated to pharmacists.

- **Considerations ethics:** Participation in our study was anonymous. Our participants were informed that their participation would be voluntary and the information provided would be used strictly for research purposes.

Analysis statistical: It was made using the software (SPSS: Statistics Package for social sciences, version 26). And the test chi^2 was carried out at the significance threshold alpha < 0.05.

Results

HAS. Results of the investigation big audience

In total, out of 200 questionnaires administered to the general public, 158 responses were obtained from questionnaires sent out, representing a participation rate of 79% has features socio-demographic.

Distribution according to gender: Of the 158 responses received, 98 are female, representing 62% of the respondents, while 60 are male, representing 38% of the respondents. The gender ratio is 1.63 in favor of the female gender. Figure 1 shows the distribution by gender.

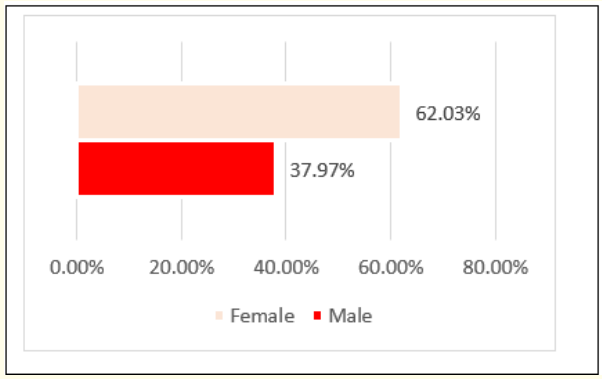


Figure 1: *Distribution of their population according to the sex.*

Distribution according to age: The age of respondents himself distributed according to the slices of ages expressed in effective and in percentage as presented in the figure 2:

- 39 answers for their population having age lower has 20 years either 24.68%.
- 77 answers for their population whose age is understood between 20 and 40 years or 48.73%.
- 30 answers for their population whose age is understood between 40 and 65 years or 18.99%.
- 12 answers for their population of which age east superior has 65 years either 7.59%.

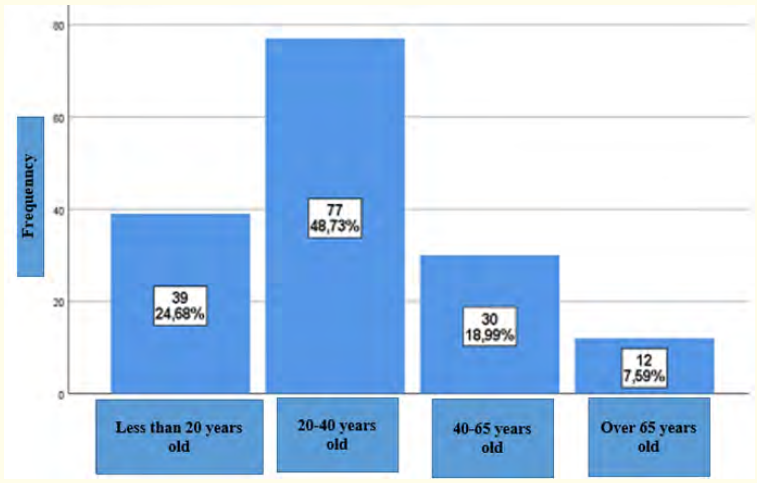


Figure 2: *Distribution of the population by age.*

Level framework: 7.59% of the study population declared themselves uneducated. Among the educated population, 5.06% have a primary level. 24.05% have a secondary level and 63.29% have a university level.

Figure 3 shows the distribution of the population according to educational level.

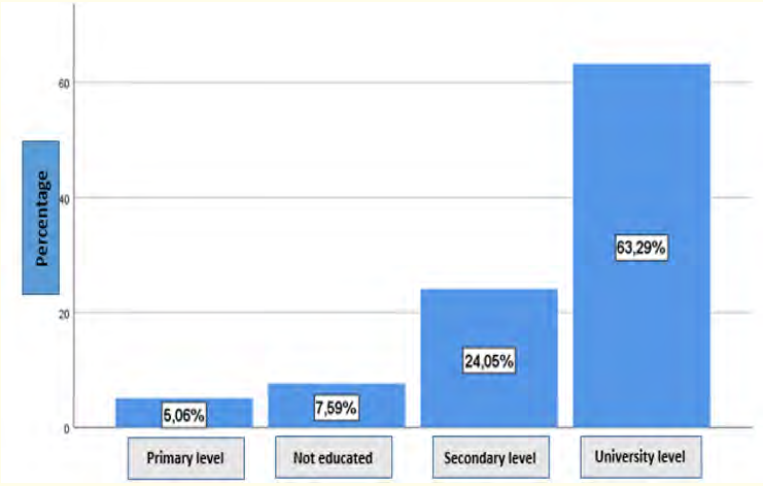


Figure 3: *Distribution of their population according to the level instruction.*

Attitude and awareness of their population face at product

Frame acknowledgement of their deficiency

Among the respondents, 6.11% say they have no idea about the consequences of vitamin C deficiency. On the other hand, 48.10% of respondents are aware of the risks associated with vitamin C deficiency, particularly scurvy, while 44.94% mention the possibility of a low intake. in vitamin C, called hypovitaminosis C. Figure 4 shows distribution according to recognition of vitamin deficiency C.

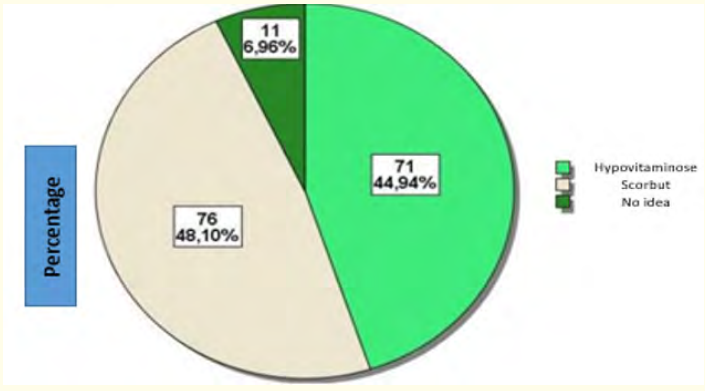


Figure 4: *Distribution according to their acknowledgement of their deficiency in vitamin C.*

Perception on their contraindication of product: Figure 5 shows us that only 18 people or (11.39%) were aware that vitamin It is contraindicated in the subjects having renal failure or predisposed to this last.

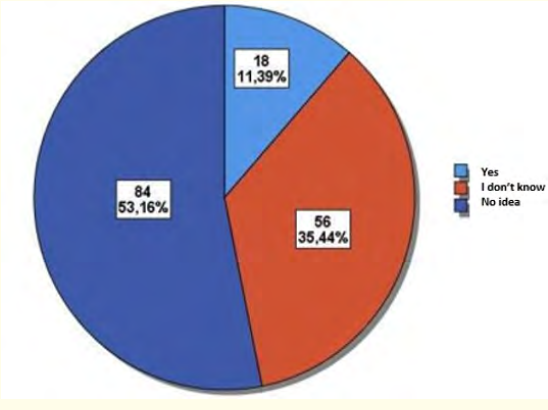


Figure 5: *Distribution of their population in function of their contraindication has their vitamin C.*

Frame statement of effects adverse effects: Our study showed that 83 people (52.53%) did not report any adverse effects, 36.71% (n = 58) reported them to the pharmacy and only 10.76% (n = 17) the notified to their doctor. Figure 6 shows this.

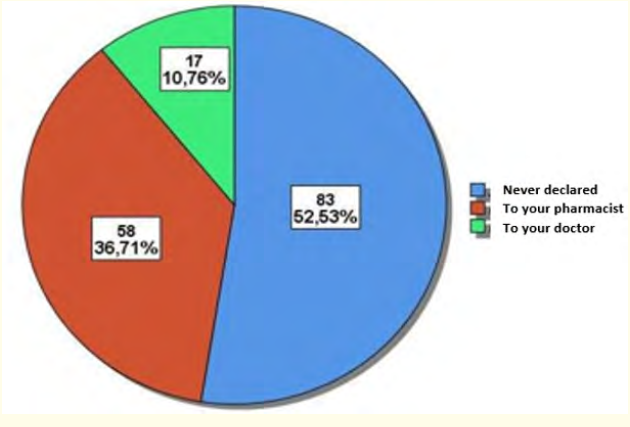


Figure 6: *Statement of the effects unwanted.*

Consumption of the food rich in vitamin C

Notice on their wealth in vitamin C of the habits Moroccan food

It is noted that among the people surveyed, 72 people (45.57%) think that Moroccan eating habits contain vitamin C compared to 86 people (54.43%) who do not think so. Figure 7 illustrates this.

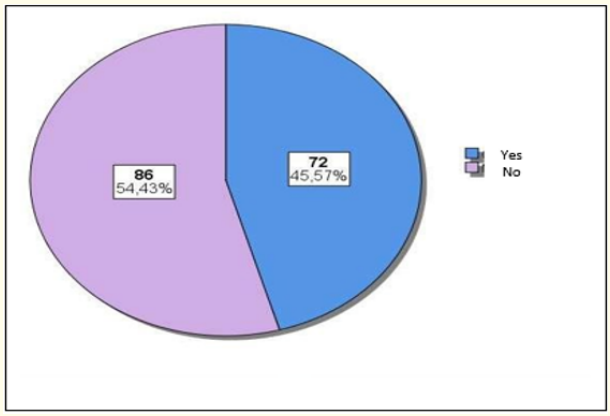


Figure 7: *There is wealth in vitamin C of the habit's food Moroccan women.*

Frame consumption of the vegetables/fruits sufficient for covering the need for vitamin C

During our study, the majority of people surveyed n=111 or (70.25%) believed that the consumption of vegetables/fruits at daily would be sufficient for covering the need for this vitamin. Figure 8 summarizes the opinions on the coverage in need of vitamin C.

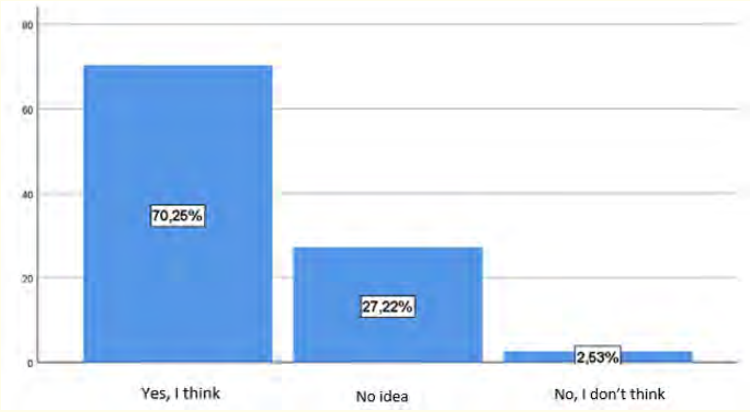


Figure 8: *Notice on the cover in need of their vitamin C.*

Consumption regular of the fruits/vegetables (Potato, orange, cabbage, etc.)

58.23% (n = 92) declared consume fruits and vegetables on a daily basis; on the other hand (n = 22) 13.92% declared consuming fruits according to the seasons and only (n = 2) people declared consume it infrequently. Figure 9 shows reviews on the contribution of their vitamin C through the consumption of fruits/vegetables.

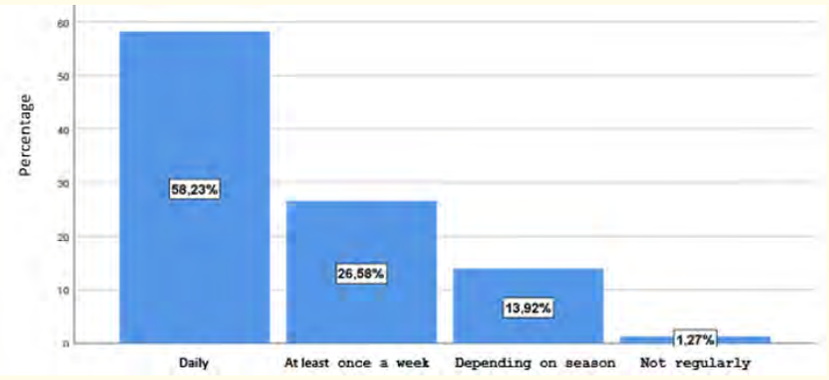


Figure 9: *Notice on their consumption in fruits/vegetables.*

Other types of food rich or enriched in vitamin C

Our study showed that 86.61% (n = 140) reported not using foods fortified with vitamin C compared to 11.39 (n = 18) who used other foods rich or fortified with vitamin C. Figure 10 shows the opinions on the other types of food rich in vitamin C.

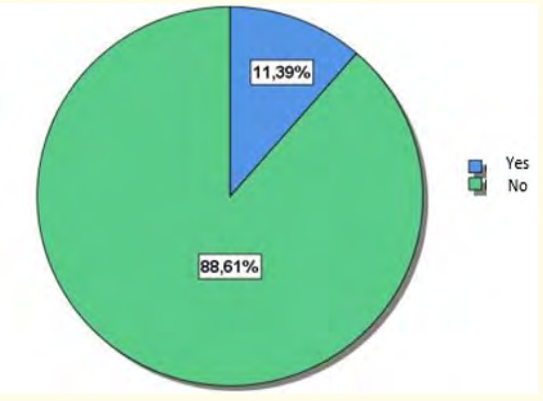
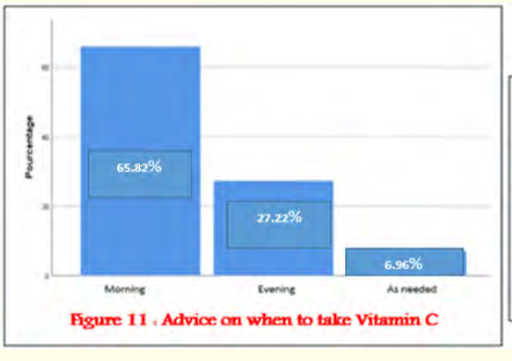


Figure 10: *Notice on the others food rich in vitamin C.*

Their supplementation in vitamin C

Moment of their supplementation: We note that 65.82% declared take their supplementation the morning, 27.22% took it in the evening and 6.96% as needed. For these same people surveyed, 48.70% declared take their supplementation has distance from meal against 51.30% who they were taking at moment of the meal. Table 1 and figure 11 show this.



	Frequency	Percentage
Away from the meal	77	48,7%
In the middle of the meal	81	51,3%

Table 1 : Timing of taking Vitamin C

Figure 11 and table 1

Duration average of use: 56.96% of respondents reported that they used the product for a duration of less than one week while 10.13% of the study population reported use for a duration of more than two weeks. This is represented in figure 12.

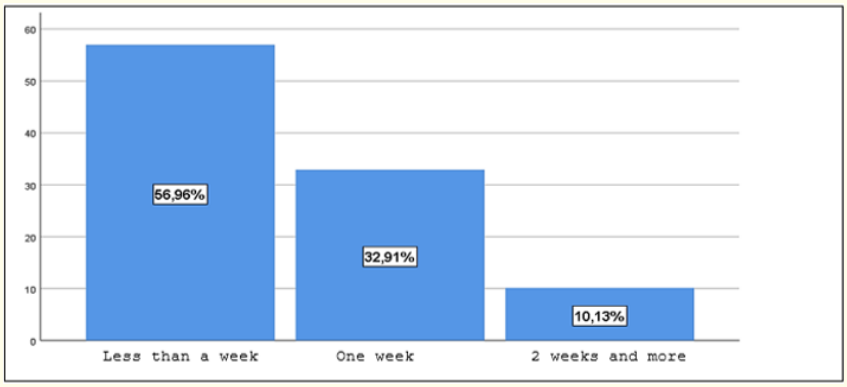


Figure 12: *Notice on the duration average of use of their vitamin C.*

Frame preference of the shapes pharmaceuticals: According to the responses, it was observed that 74.15% of consumers preferred the effervescent form of vitamin C, while 7.59% preferred another form. Figure 13 illustrates this.

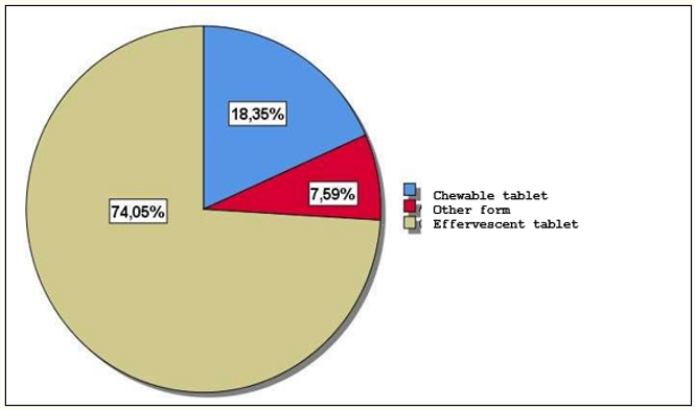


Figure 13: *Preferences of the shapes pharmaceuticals of their vitamin C.*

Results of the investigation pharmacy

Rate: Our questionnaire developed on Google Forms was sent to 150 community pharmacies via email and the platforms: Twenty-one of the email addresses used were No functional (receipt of the message "status notification (Failure)" in return).

HAS there following of first sending: 67 answers have summer collected.

After a follow-up, 36 new responses were added. The results out of 103 responses obtained, it was noted that 93.20% respondents had for status pharmacists against 6.80% of pharmacy technicians (Figure 14).

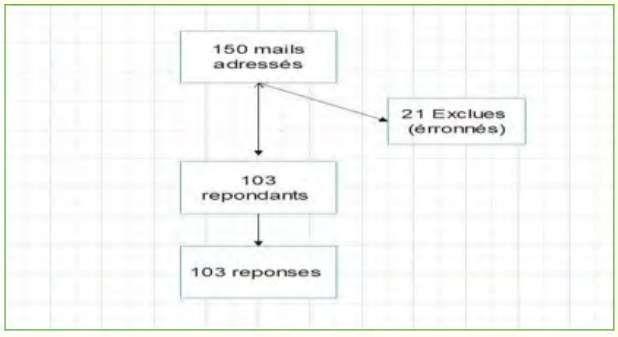


Figure 14: *Flow sheet of the study.*

Features of the people surveyed

Status respondents: The population studied was mainly composed of pharmacists (93.20%) against (6.80%) of preparers (Figure 15).

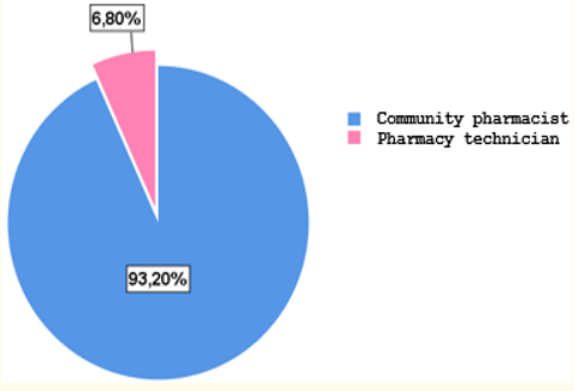


Figure 15: *Status of staff participant.*

Environment exercise: The pharmacies surveyed were located mainly in urban municipalities (90.29%) compared to (9.71%) in rural areas (Figure 16).

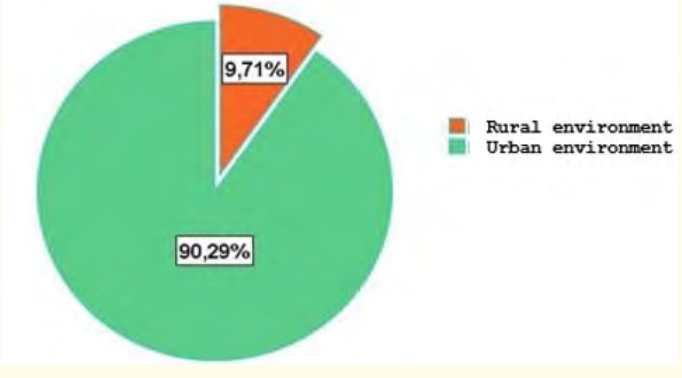


Figure 16: *Distribution according to the environment exercise.*

Age of the consumers of their vitamin C: the slice of age of 35 to 50 years, represents 37.86%, followed by their slice of age of 20 at 35 years old, with 32.04% of responses. People under 20 years come in third place with 30.10% answers (Figure 17).

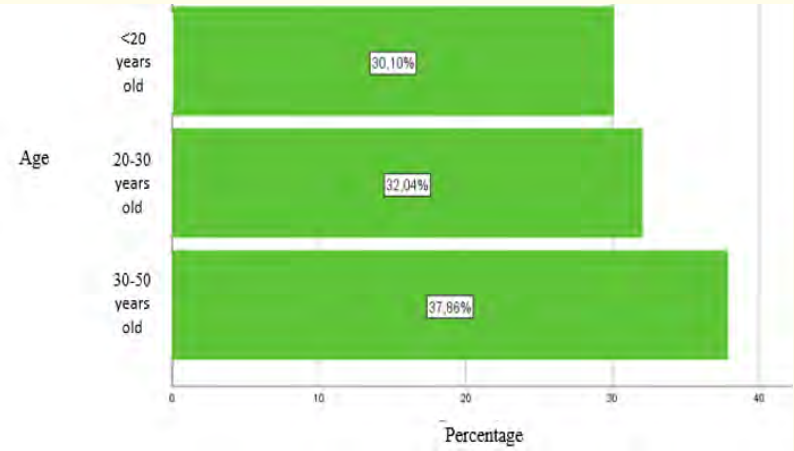


Figure 17: *Distribution of the slices of ages the more consumers of their vitamin C.*

Frame of dispensation of product

There is base of their dispensation has the pharmacy: According to the participating pharmacies, the dispensing of vitamin C at the pharmacy is mainly done through self-medication, with 39.83% of responses. Then, advice to the pharmacy represents 33.47% of the responses, indicating that pharmacists actively recommend vitamin C to customers. Finally, medical prescription represents 26.69%, which means that some patients see that vitamin C must be prescribed by a doctor. These results highlight the different modalities of dispensing vitamin C in pharmacies as shown in figure 18.

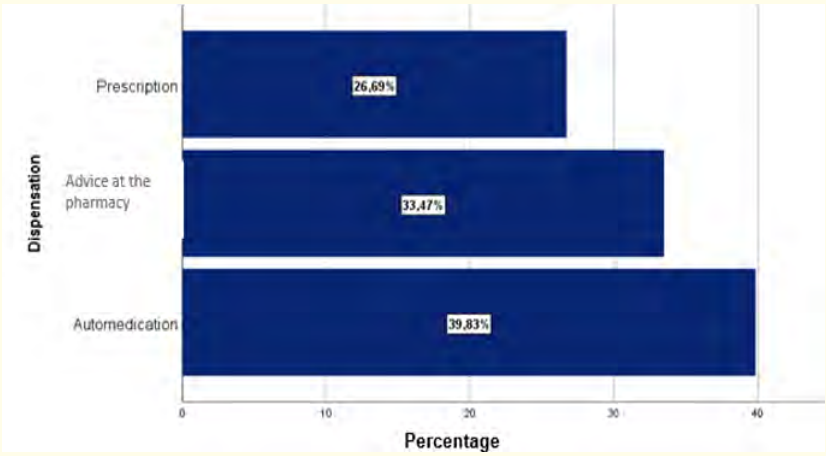


Figure 18: *Distribution of their frequency of dispensation of their vitamin C has the pharmacy.*

Frame origin of their prescription: Due to its demand over the counter, prescriptions containing vitamin C come from various structures, on a classification of order decreasing 30.70% of prescriptions come from public hospitals, 27.91% come from clinics, 23.72% from semi-public hospitals and 17.67% from practices of medicine general as shows in figure 19.

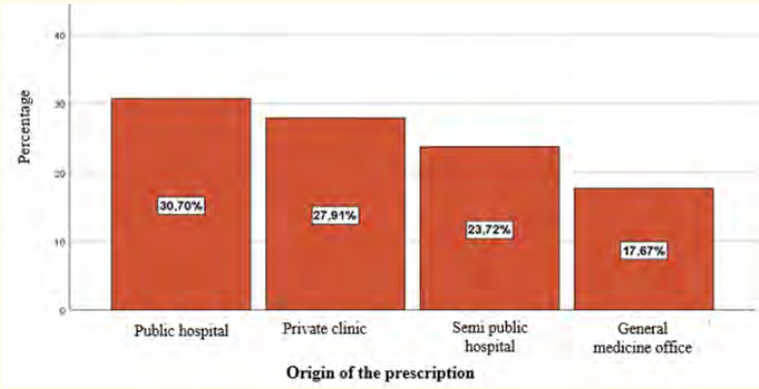


Figure 19: *Distribution of their origin of the prescriptions.*

Features of their consumption of their vitamin C

Level of their education: Concerning the level of schooling, 77.67% participants estimated that the level of education influences the intake of vitamin C in so much that supplement versus 22.33%. Figure 20 shows participants' opinions on the influence of educational level on the taking of their vitamin C.

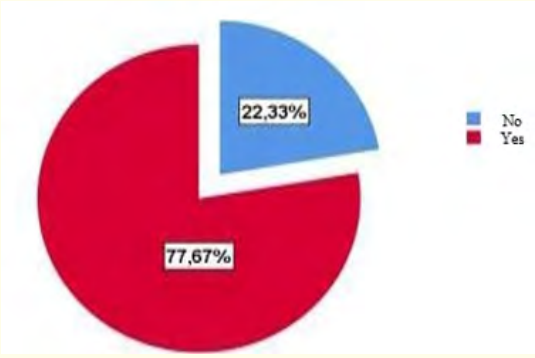


Figure 20: *Influence of level of schooling on their socket of their vitamin C.*

Accessibility: Figure 21 represents the socioeconomic accessibility of vitamin C, 89.32% of participants believed that vitamin C is accessible to all social groups against 10.68%.

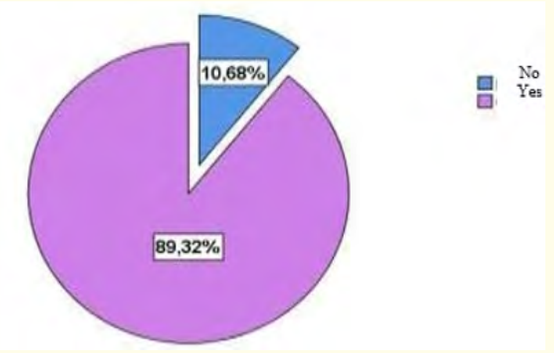


Figure 21: *Accessibility socioeconomic of their vitamin C.*

Increase of their consumption of their vitamin C: The people interviewed and who responded to OUR questionnaire, unanimously estimated that since the arrival of Covid-19, the consumption of vitamin C has increased in their pharmacies. Pharmacies' opinions on the increased demand for vitamin C during the Covid-19 period are reported in figure 22.

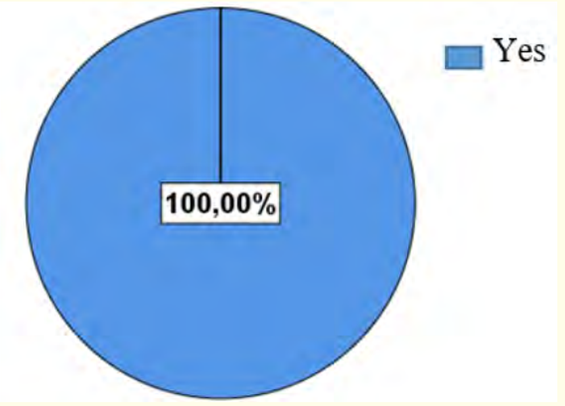


Figure 22: *Notice of the pharmacies by report has the increase in consumption linked at Covid 19.*

The motivations of their consumption of their vitamin C: The most frequently reported cases by pharmacies related to consumption of their vitamin C are presented in their figure 23. Fatigue represents 49.04% answers. Then, seasonality is mentioned by 28.37% of responses. Finally, other reasons such as self-medication are cited by 17.31% of responses.

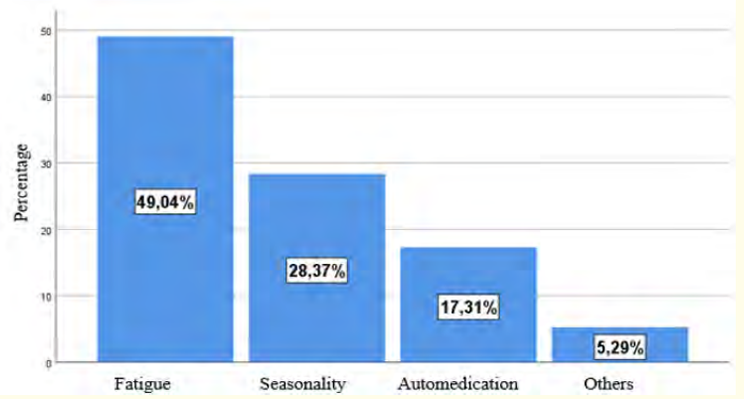


Figure 23: *Distribution of the observations related has their consumption of their vitamin C.*

The status physio-pathological related has there vitamin C consumption: Respondents estimated that vitamin C prescriptions were mainly for anemic subjects (31.82%) followed by physical exercise (27.27%) as shown in figure 24.

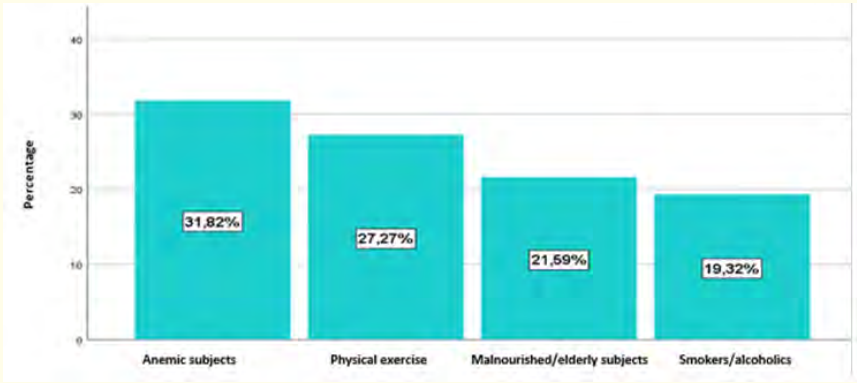


Figure 24: *Prescriptions in the function of the statutes pathophysiological.*

Features and assessment of the knowledge

Estimate of the needs in vitamin C: The majority of respondents (30.10%) estimated the need for vitamin C in the range of 100 to 150 mg according to the recommendations. The participants' responses are presented in figure 25.

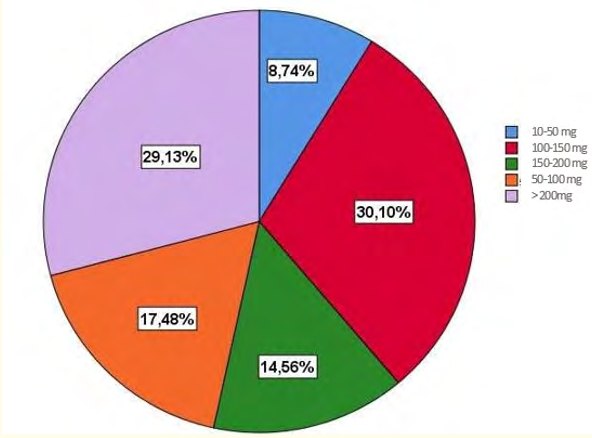


Figure 25: *Estimate of the needs daily newspapers in vitamin C.*

Their place of their vitamin C in pharmacy: Fifty-three respondents (51.46%) find that vitamin C occupies an important place in pharmacies as a dietary supplement, as shown in figure 26.

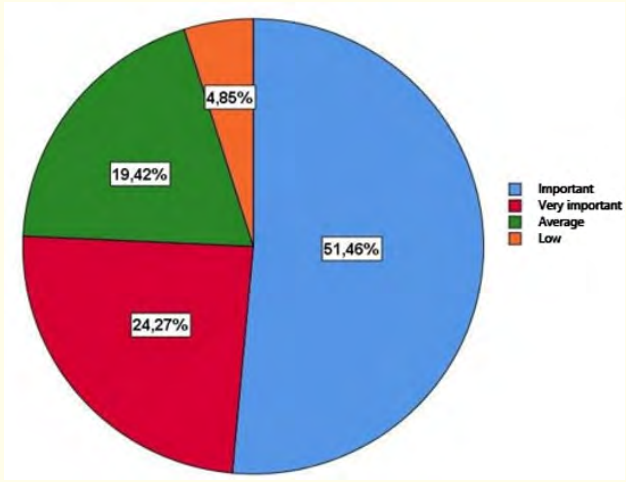


Figure 26: *Place of their vitamin C in so much that supplement eating.*

The advice in pharmacy: Among the reasons more frequent which motivate the advice of vitamin C in pharmacy, the figure 27 shows the reasons that motivate the recommendation of vitamin C in pharmacies. We find mainly the strengthening of immunity with (31.78%), anemia (27.57%), then fatigue (22.43%), then seasonality represented by colds/flu with (18.22%).

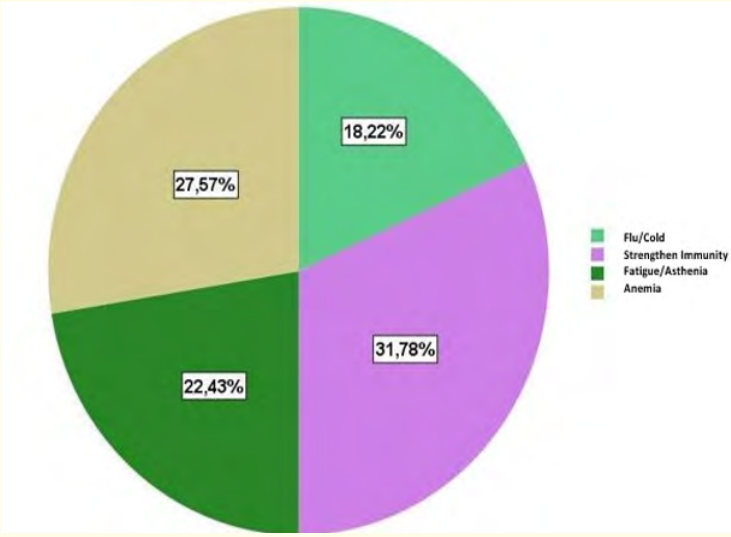


Figure 27: *The reasons who motivate the advice of their vitamin C in pharmacy.*

Duration average of use of their vitamin C in advice: East recommended at the pharmacy their vitamin C for an average duration of less than one week for 31.82% of respondents, less than 10 days for 27.27% of respondents, without medical advice for a period of up to 2 weeks for 21.59% and as needed for 19.32%. Figure 28 shows the average duration of recommended vitamin C in the pharmacy.

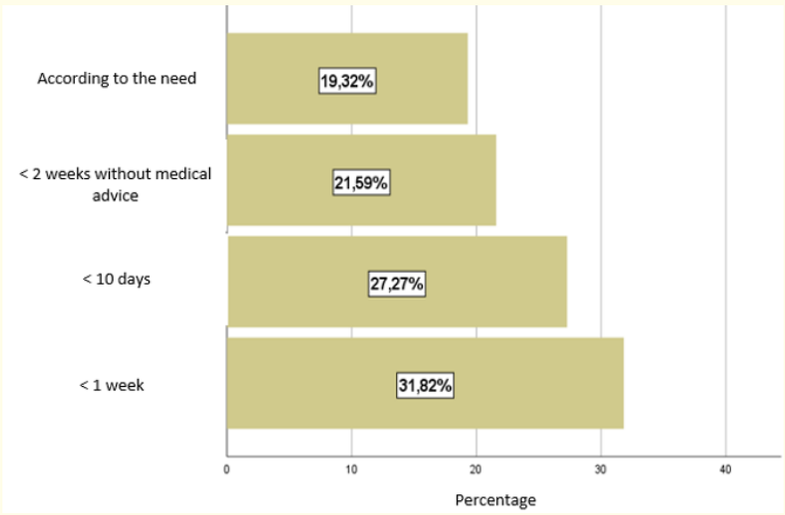


Figure 28: *Duration average of use of their vitamin C in advice.*

Effects unwanted reported: The most common adverse effects reported to the pharmacy when taking vitamin C are classic digestive adverse effects: Nausea and diarrhea.

There is socket in account of the interactions at moment of dispensation: 68 respondents, or 66%, declare being conscious of the interaction potential between vitamin C and other medications when dispensing. In contrast, 34% of respondents indicate that they do not hold account of these interactions. Taking into account linked interactions to vitamin C is presented in table 2.

Socket in account of the interactions of their vitamin C	Percentage
Yes	43%
No	57%

Table 2: *Distribution of the implications of the interactions related has their vitamin C.*

Preferences of the shapes pharmaceuticals: According to the responses, the most popular pharmaceutical form of vitamin C in pharmacies is the effervescent form, with 38.31% of respondents preferring it. The chewable tablet form is also popular, with 26.61% of respondents choosing it. Combinations containing vitamin C are also popular, representing 19.35% of responses. Figure 29 shows the preferences for pharmaceutical forms of vitamin C.

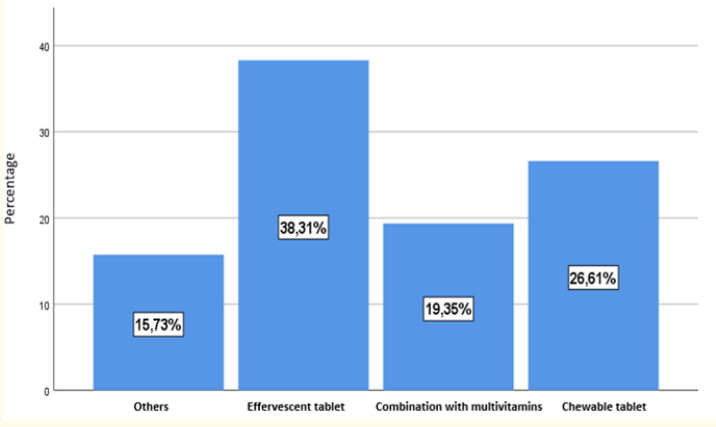


Figure 29: *Distribution according to the preferences of the shapes pharmaceuticals of their vitamin C.*

Results of the analyses statistics

The chi-square test on the educational level of the population, n = 146 or (92.41%) was found to be positive with a value of P = 0.008 which is less than 0.05. Therefore, we can conclude that there is a relationship statistically significant between educational level and use of vitamin C supplementation without opinion medical, and that the latter increases their consumption of the vitamin C within this same Moroccan population.

Regarding age, the age group from 20 to 40 was the most represented in our sample with a participation of 48.70%. However, we found a negative chi-square test and a P value of = 0.069. Therefore, we can say that there is no statistically significant association between the variable age and vitamin C consumption, and therefore age would not be a contributing factor for this.

The number of boxes of vitamin C dispensed in pharmacies according to the practice environment shows a chi-square test with a value of P = 0.70. So, there is no statistically significant relationship between the practice environment and the number from the box of the vitamin it is dispensed in pharmacies.

The results of the statistical analysis are summaries in the table 3.

Statistical test chi²		P-value
Level instruction and the use of the supplementation no opinion medical	Positive	0.007
Age and the vitamin consumption c	Negative	0.069
Environment exercise and number vitamin box it is dispensed in pharmacies	Negative	0.703

Table 3: *Correlation between the variables on their request of their vitamin C in pharmacy.*

Discussion

The objective of this work is to complete theoretical knowledge on vitamin C and examine the responsibility and role of the community pharmacist in providing advice on this product. Pharmacists occupy a key position as public health actors and play a vital role in dispensing OTC products such as vitamins C, which can be obtained without a medical prescription.

Over-the-counter products in general, and vitamin C in particular, can be used for therapeutic or as supplements vitamins. However, it is essential to emphasize that their use must be correct and rational. Even if vitamin C is considered relatively safe, it is important to understand that it is not without risks and that its incorrect use or Excessive use can lead to adverse effects and drug interactions.

The community pharmacist, positioning himself in a prime position, must therefore to incite his patients or clients in use correct of this vitamin.

Data demographics

Regarding the study population, demographic data regarding gender suggest a female predominance at 62%, with a sex ratio M/F in favor of the sex female.

As for the age of consumers, all age groups are represented. However, the 20 to 40 age group stands out from the others. This can be explained by the fact that fatigue and asthenia are the main motivations. of consumption of vitamin C In this slice of age. In second place is the under 20 age group, dominated by a representation student and of young people athletes. The students can consume vitamin C to improve their concentration during exam periods, sometimes combined with other multivitamin and trace element complexes such as magnesium. It is important to note that regular physical exercise can increase the need for vitamin C by compared to sedentary people, which may explain the motivation of young athletes to supplement with vitamin C.

Furthermore, the level of education of the population particularly influences the purchase of food supplements and especially vitamin C. The population with a higher level of education consumes more vitamin C than those with a lower level of education. This finding is consistent with the results reported by pharmacies. The influence of the purchase of vitamin C by this part of the educated population leads us to hypothesize that this last obtains her information from the internet, pushing her to adopt a behavior of self-medication with vitamin C, which would call into question the objectivity and reliability of the effects of the supplement sought.

This observation was also revealed by the study conducted by Youssoufi K and Zoudani F and presented at a conference on risk communication in times of crisis and what contribution of the health actors facing risky behaviors, case of self-medication by vitamin C [4].

Framework of prescription and status pathophysiological

Among the pharmacy clientele oriented towards taking of the vitamin C himself find the smoking/alcoholic subjects who are beginning to express interest in this product in order to recover the amount of vitamin C recommended.

The prescriptions noted in pharmacies come from various sources and concern hospitals as much as public, semi-public and medical practices. The reasons for prescriptions mainly concerned subjects anemic, the malnourished subjects and the elderly. This shows that prescribers are particularly attentive attention to the deficit of this vitamin and show real interest in supplementation.

It should also be noted that the amount of vitamin C reported was slightly overestimated by participants. compared to the recommendations.

Framework of consumption

Regarding the framework of consumption, our study showed that it is influenced by three parameters which are advice at the pharmacy, medical prescription, and an influence from the environment - internet (advertising) or following one's own personal experiences.

The responses reported by pharmacists were closely complementary to those of consumers, the most frequent framework for dispensing was the patient's spontaneous request (self-medication) (38.83%), followed by pharmacy advice (33.47%), only 3 dispensing out of 10 were made below prescription medical. Of more, the majority of pharmacists (49.7%) estimated that one in two deliveries, emanates from a spontaneous request from the patient.

According to the perception of pharmacists who participated in our study, the demand trend has greatly increased since arrival of the Covid-19 pandemic to the present day, the possible causes of this increase would be the strengthening of immunity linked to Covid-19. This has been observed in several country for the same reasons as the reports a study Kenyan [5] and an Algerian study [6].

Among the available pharmaceutical forms, it emerges from this study that consumers prefer the effervescent and chewable forms over other forms. This statement is also consistent with observations reported by pharmacists and pharmacist assistants contacted by our study.

For elderly subjects, it should preferably be requested on prescription since they are more at risk of adverse effects given their filtration status. reduced glomerular, which can cause interaction problems medicinal.

The study conducted by IQVIA (Institute for Quality and Efficiency in Health Care) shows a growing trend in vitamin C consumption over the years. However, it is also mentioned that some vitamin C products remained stable between 2016 and 2019, which indicates some variability in consumer preferences.

Among the products consumed have base of vitamin C, we finds in head:

- Product A: Vitamin C combined with minerals in Effervescent tablets were the most consumed regardless of the Covid - 19 period.
- During this same period from 2016 to 2019, products B, C, D and E recorded a relatively low consumption weak. However, during the period 2019-2021, these products attracted increasing interest from consumers. This increased demand can be explained by an increase in vitamin request C, which resulted in a stock shortage of certain products (such as product A). Thus, consumers have turned to B products, C, D and E to meet their vitamin C needs.
- A peak in demand was observed over the period 2019-2021; we explain this in this sense by frequent self-medication gaining ground during this period justifying this peak.
- It is also worth noting that the study reported by IQVIA on vitamin C shows a rapidly increasing turnover of vitamin C over the period 2016 - 2021 having generated thousands of dirhams. Table 4 summarizes the vitamin market data C over the period 2016 - 2021 reported by IQVIA [7].

		Dirhams year/ 16 (Thousands)	Dirhams year/ 17 (Thousands)	Dirhams year/ 18 (Thousands)	Dirhams year/ 19 (Thousands)	Dirhams year/ 20 (Thousands)	Dirhams year/ 21 (Thousands)
Product (A)	CPR. EFF 1 G 10	12194	11311	9707	11263	43585	54943
Product (A)	CPR. EFF 1 G 10	6834	6829	5393	6468	26594	34380
Product (A)	CPR. EFF 1 G 10	2674	2748	1994	2216	18473	25046
Product (A)	CPR.EFF 1 G 10	586	638	629	772	4600	5273
Product (A)+Ass	CPR. EFF 1 G 20	3574	3443	2769	3479	3521	4060
Product (A)+Ass	CPR. EFF 1 G 10	4340	4002	4158	4711	16638	20290
Product (A)+Ass	CPR. EFF 1 G 10	1983	1827	1850	2162	11808	10942
Product (A)+Ass	CPR. EFF 1 G 20	2357	2175	2308	2548	4831	9348
Product (B)	CPR.EFF 1 G 20	0	0	0	0	148	187
Product (C)	CP. EFF 20 MG 10	0	0	6	12	54	79
Product (D)	CPR. EFF 20	0	0	0	0	18	8
Product (E)	CP HAS SUCK 500	118	178	146	73	132	0
Product (F)	CAPSULE 60	0	0	0	0	0	0
Product (G)	CP. BICOUCH 15	0	0	0	0	0	0
Product (G)	CP. BICOUCH 30	0	0	0	0	0	0
Product (H)	AMP 500 MG 6 5 ML	0	0	0	0	0	0
Product (H)		901	302	2	0	0	0
Product (I)	AMP. 500 MG 5 5 ML	0	0	0	0	0	0

Table 4: *The data of walk on their vitamin C accomplished by IQVIA (Institute for Quality and Efficiency in Health Care) over the period (2016 - 2021) [7].*

Compared to other studies conducted in France and Togo for the same reasons on vitamin C supplementation, our results are consistent with these studies regarding vitamin C supplementation without medical advice. Table 5 summarizes these data reported by these studies.

Country	Year	Titled	Size N Eche	Frame of consumption
France (Lyon)	2017	Prescription of vitamin C in medicine general [3]	72	Hypovitaminosis C
Reunion Island (France)	2018	Study of their vitamin C deficiency in a population geriatric [8]	120	Population geriatric vitamin C deficient
Togo	2021	Vitamin C and advice pharmaceutical in period of Covid-19 [9]	198	Self-medication by vitamin C
Morocco	2024	Our study	158	Vitamin C effect therapeutics and supplementation at Morocco

Table 5: *Data comparison justifying (supplementation in vitamin C) to that of literature.*

Boundaries of use of their vitamin C

It exists despite all rare contraindications to taking the treatment by vitamin C, it is first of all the deficit in G-6-PD. The taking vitamin C as a supplement is contraindicated and the limit considered safe by the AFSSA for dietary intake of ascorbic acid is 1g/day, beyond which its consumption causes potentially hemolysis in these patients serious [10-12].

However, oxalosis (or primary hyperoxaluria) is also a contraindication given the transformation of ascorbic acid into oxalate, which promotes lithiasis. renal in affected subjects by this disease. The same is true for individuals likely to have frequent renal colic with oxalate stones of calcium [12,13].

Boundaries of the studies

During our study, several challenges could have affected the interpretations and the conclusions.

- The risk of the information who could be biased (bias of the answers) on the use of vitamin C impacted by the transition to the "covid-19 period".
- We have found an imbalance on the distribution of responses that came from pharmacies located in urban areas and those located in rural areas.
- However an interrogation attracted our curiosity, the results would they have summer different if the survey had been carried out over a period not impacted by covid-19?

Recommendations

In light of the results obtained in these studies, we propose some recommendations:

- Effective pharmacist-patient communication is a key element for awareness.
- In order to avoid any risk of excessive consumption of vitamin C and the gastrointestinal manifestations that may result from it, we recommend establishing effective pharmacist-patient communication and that the latter advocate for a recommended daily intake of vitamin C, to respect the dosages in order of prevent adverse effects related to excessive consumption.
- In order to maintain a good vitamin C content, we recommend not freezing, to protect from heat and avoid a storage prolonged food.

- Pay special attention to women pregnant, who could request vitamin and vitamin supplementation C. From a generally speaking, pregnant women should be informed of the ban of any medication no opinion medical or pharmaceutical.
- When vitamin supplementation is needed in the elderly, it is necessary to consider supplementation by means of fruits and vegetables fresh, before tipping over on another form of supplementation.

Conclusion

In conclusion, our study aims to determine the consumption and supplementation of Vitamin C among the Moroccan population, and to evaluate the attitude of community pharmacists when dispensing this food supplement. The latter play an important role in raising awareness among the population regarding the correct use of this essential vitamin, in order to avoid any incorrect use leading to an overdose which can compromise the functional or vital prognosis in these patients.

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