



## Cohort Study

## Quality of life assessment in patients treated with nasal corticotherapy for allergic rhinitis: A cohort study



A. Chaouki<sup>\*</sup>, A. Mkhatri, K. El Bouhmadi, S. Rouadi, Y. Oukessou, R. Abada, M. Roubal, M. Mahtar

ENT Department, Ibn Rochd Teaching Hospital, Morocco

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## ABSTRACT

**Introduction:** Allergic rhinitis (AR) is a chronic nasal pathology induced by an inflammation of the mucous membranes due to a dependent IgE reaction following allergenic exposure. The main symptoms are rhinorrhea, nasal itching, nasal obstruction and sneezing bursts. It highly affects the patient quality of life (QoL) in many levels making it a public health issue.

The aim of this study is to assess the QoL of patients with AR as well as the level of its improvement after nasal corticotherapy.

**Materials and methods:** From June 2019 to February 2020, a prospective study was carried out based on the use of the validated Arabic version of the RQLQ (Rhinoconjunctivitis Quality of Life Questionnaire) on a cohort of AR patients to measure their QoL before and after three months of treatment by “Budesonide”.

**Results:** A total of 70 patients participated in the study with an average age of 39.54 years with a sex ratio of 0.60. Their total RQLQ score was up to 4.28, improved to 2.35 after treatment. Also, a statistically significant improvement in sub-scores was also observed ( $p < 0.001$ ): activities (from 4.43 to 2.29), nasal symptoms (from 5.00 to 2.80), eye symptoms (from 3.38 to 1.80), practical problems (from 4.29 to 2.18), general problems (from 4.63 to 2.78) and emotional state (from 4.28 to 2.43).

**Conclusion:** The RQLQ is a reliable tool to evaluate the QoL in AR patients, stating the negative influence of AR on patients daily life and the effectiveness of nasal corticosteroid treatment.

## 1. Introduction

Allergic rhinitis (AR) is defined, according to the “World Allergy Organization”, as a symptomatic disorder of the nose resulting from an Immunoglobulin E (IgE) mediated immunological reaction following exposure to allergen. The major symptoms are rhinorrhea, nasal itching, obstruction and sneezing which are reversible either spontaneously or with treatment. It is considered as the most frequent manifestation of allergy, with a rate of 10–30% in adults and up to 40% in the paediatric population. Thus, it stands as a public health problem [1].

Multiple studies had shown that the AR symptomatology goes beyond the ENT sphere and impacts highly the patients’ quality of life (QoL) [2]. Overall, one in two patients with AR presents an alteration of his QoL [3], that can concern any parameter causing mood disorders, sleep disorders, discomfort in sport activities, focus disorder, impacting also negatively their relationships with others [4]. In parallel, AR is

associated with a substantial declination of the professional performances and a loss of productivity [5]. To evaluate the QoL related to AR patients, multiple surveys are available, both generic and specific.

The treatment of AR still not well standardized, many different therapeutic classes are used in the same patient and the efficiency not always obtained which impact his QoL [6].

## 2. Aim of the study

Our study aims to evaluate the quality of life in patients with AR, in one hand; and in another hand, to evaluate the efficiency of the nasal corticotherapy in the therapeutic arsenal.

## 3. Patients and methods

A prospective cohort study was carried out on patients recruited in

<sup>\*</sup> Corresponding author. Lotissement Marjana, Sidi Maarouf, Casablanca, 20190, Morocco.

E-mail address: [anasschaouki.ac@gmail.com](mailto:anasschaouki.ac@gmail.com) (A. Chaouki).

the medical consultation of the ENT Department of the Ibn Rochd hospital of Casablanca, between June 2019 and February 2020. All the patients presented with AR and were treated with nasal corticotherapy based on “budesonide” with a posology of 400 µg per day for 3 months. The exclusion criteria were the age under 17, given the absence of a validated QoL survey translated in Arabic adapted to teenagers, the patients already operated for their condition and the ones who refused to participate.

The medical history, risk factors and epidemiological and clinical parameters were stated. The AR was classified according to the 2008 ARIA classification [7]. The treatment modalities were detailed.

The survey chosen was the “Rhinoconjunctivitis Quality of Life Questionnaire” (RQLQ), made for adult patients (17–70 years old) and based on 28 questions (items) in seven themes (limitation of activities, sleep disorders, non T nasal/ocular symptoms, practical problems, nasal symptoms, ocular symptoms, emotional issues). Using a 7 points scale where 6 stands for “Extremely troubled” and 0 for “Not troubled”, on a yellow card for the following items: activities, sleep, general symptoms, practical problems, nasal and ocular symptoms. For the emotional state, a 7 points scale on a green card is used concerning the frequency of bothersome secondary to nasal or ocular symptoms, where the 6 stands for “All of the time” and the 0 for “None of the time”. Concerning the item “activities”, the patients were asked to identify 3 activities that matter to them, that they practice often and where they feel themselves limited because of their rhinoconjunctivitis.

This questionnaire was translated and validated in Arabic and used on its form where an investigator, the doctor leading the consultation, asks the questions [8]. The final score is an average of the answers to the 28 questions and, for the individual themes, the score is the average of the answers of their particular elements.

The statistical analysis was performed by the Methodological Support Unit and was based on the SPSS 20.0 software.

The study was reported in line with the STROCSS criteria [9]. And register in open access database (UIN: researchregistry6028).

Ethical approval has been exempted by our institution.

## 4. Results

### 4.1. Epidemiological results

A total of 70 patients were enrolled in our study. The mean age was  $39,54 \pm 16$  years old with extremes from 17 to 82 years old. The sex ratio M/F was equal to 0,60 (women: 62.9%). 94,3% of our patients were from Casablanca – Settat region.

### 4.2. Medical history

The medical background of our patients is represented mostly by allergic conjunctivitis in 75,7% of cases, atopic disorders in 44,3% of cases and food allergies in 28,6% of cases. Concerning their family history, it was found in the parents and siblings a rate of 31,4% of AR, 21,4% of atopic disorders and 20% of allergic conjunctivitis. Also, 20 patients were active smokers while 37 were frequently exposed to smoke.

### 4.3. Environmental factors

The sunny and airy character of the patients homes was found in 58,6% of cases, with a close contact with trees in 70% of cases. Also, a contact with Acari was found in 87% of cases, a contact with cockroaches in 58,6% of cases and a contact with animals in 10% for cats, 7,1% for dogs and 14,3% for birds.

### 4.4. Clinical features

All our patients came to our consultation for a runny, itchy and

blocked nose with sneezing. Asthenia and nasal bleeding was reported in 17,1% of cases, smelling disorders in 14,3% and nocturnal awakening in 22,9%. The clinical examination found on anterior rhinoscopy an inflammatory nasal mucosa with aqueous discharge and a hypertrophy of the inferior turbinate in 10 patients.

### 4.5. Classification of the AR

According to the ARIA (Allergic Rhinitis and its Impact on Asthma) classification, 17,1% of our patients were classified as intermittent mild, 10% as intermittent moderate to severe, 15,7% persistent mild and 57,2% as persistent moderate to severe.

### 4.6. Further exploration

A Prick test was performed in 12 patients (11,4%), specific IgE dosing in 2 patients and a complete blood count (CBC) showing a hypereosinophilia in 2 patients. When the allergen is known, measures of avoiding it are taken for 20% of our patients.

### 4.7. Evaluation of the QoL

#### 4.7.1. QoL score for each item

The results of the RQLQ showed that the most bothersome symptoms are the nasal symptoms with a score of  $5,00 \pm 0,93$  (corresponding to “Very troubled”), followed by general symptoms with a score of  $4,63 \pm 1,39$  (“Quite a bit troubled”), then the activity limitation with a score of  $4,43 \pm 1,72$  (“Quite a bit troubled”), then the practical problems with a score of  $4,29 \pm 1,97$  (“Quite a bit troubled”), then the sleep disorders with a score of  $4,20 \pm 1,75$  (“Quite a bit troubled”) and finally the eye symptoms with a score of  $3,38 \pm 1,86$  (“Moderately troubled”). The score of the emotional impact was equal to  $4,28 \pm 1,54$  (corresponding to a negative impact happening “A good part of the time”).

The treatment impacted positively the RQLQ score of each item while the score for the nasal symptoms became  $2,80 \pm 1,49$  (corresponding to “Somewhat troubled”), the score for the general symptoms became  $2,78 \pm 1,35$  (“Somewhat troubled”), the score for activity limitation became  $2,29 \pm 1,65$  (“Somewhat troubled”), the score for the practical problems became  $2,18 \pm 1,70$  (“Somewhat troubled”), the score for the sleep disorders became  $1,94 \pm 1,79$  (“Hardly troubled at all”), and finally the score for the eye symptoms became  $1,80 \pm 1,59$  (“Hardly troubled at all”). The score of the emotional impact became equal to  $2,43 \pm 1,57$  (corresponding to negative impact happening “A small part of the time”).

#### 4.8. These results are exposed on Table 1

The paired difference ( $\Delta t$ ) between the QoL before and after treatment for each item is stated in Table 2, for a confidence interval (CI) of 95%. Therefore, the improvement after treatment of the quality of each aspect of life considered is significant with a  $p < 0,001$ .

#### 4.8.1. Activities selected as restrained because of AR

The activities selected by patients as restrained and limited because of AR are summed up in Table 3.

#### 4.8.2. Total score

The total score of QoL before treatment was  $4,28 \pm 0,84$  versus  $2,35 \pm 1,11$  after treatment. The paired difference ( $\Delta t$ ) of the two total scores is  $1,92 \pm 0,99$ , and a confidence interval of 95% at 0,12 to 2,16. The global improvement of the QoL after treatment is significant with a  $p < 0,001$ .

## 5. Discussion

Allergic rhinitis (AR) is one of the commonest atopic diseases caused

**Table 1**  
Results of the RQLQ for each item, with a comparison between before and after treatment.

Item	Mean score and (Standard deviation) Before treatment	Mean score And (Standard deviation) After treatment	p Value
Sleep	4,20 (1,75)	1,94 (1,79)	p < 0,001
Non-Hayfever symptoms	4,63 (1,39)	2,78 (1,35)	p < 0,001
Practical problems	4,29 (1,97)	2,18 (1,70)	p < 0,001
Nasal symptoms	5,00 (0,93)	2,80 (1,49)	p < 0,001
Eye symptoms	3,38 (1,86)	1,80 (1,59)	p < 0,001
Activities	4,43 (1,72)	2,29 (1,65)	p < 0,001
Emotional state	4,28 (1,54)	2,43 (1,57)	p < 0,001

**Table 2**  
Paired difference between the QoL for each item, confidence interval and p value.

Item	Paired difference (Δt) and (Standard deviation)	Confidence interval CI	P Value
Sleep	2,26 (1,61)	[1,88; 2,64]	<0,001
Non-Hayfever symptoms	1,85 (1,35)	[1,53; 2,18]	<0,001
Practical problems	2,11 (1,70)	[1,71; 2,52]	<0,001
Nasal symptoms	2,20 (1,40)	[1,87; 2,54]	<0,001
Eye symptoms	1,58 (1,25)	[1,29; 1,88]	<0,001
Activities	2,14 (1,34)	[1,83; 2,47]	<0,001
Emotional state	1,85 (1,40)	[1,52; 2,19]	<0,001

**Table 3**  
Activities selected by patients as restrained because of their AR.

Activities	Number of patients (n)	Rate (%)
Watching TV	25	35,7
Doing the chores	21	30,0
Go shopping	19	27,1
Reading	17	24,3
Using a computer	15	21,4
Driving	11	15,7
Vacuuming	9	12,9
Playing with kids/grandkids	8	11,4
Tinkering	8	11,4
Bowling	7	10,0
Visiting family/friends	6	8,6
Outdoor activities	6	8,6
Sitting outdoor	5	7,1
Doing sports	5	7,1
Walking	4	5,7
Professional activities	4	5,7
Cycling	4	5,7
Talking	3	4,3
Eating	3	4,3
Gardening	3	4,3
Regular social life	2	2,9
Singing	1	1,4
Taking kids to the park	1	1,4

mainly by respiratory allergens [10,11]. It is a type I allergic disease of the nasal mucosa, characterized by paroxysmal repetitive sneezing, watery rhinorrhea, and nasal blockage [10].

Widely spread and still under diagnosed, the AR affects up to 60 million people in the United States (US) annually, with a rate of 10–30% of adults and 40% of children [12]. In Europe, the prevalence of subjects

with clinically confirmable AR ranged from 17% in Italy to 29% in Belgium with an overall value of 23% [13]. In Morocco, about 12 million of people are affected by AR [14].

Despite its benign character, AR represents a serious public health issue because it decreases the quality of life of patients but also considering its important economic burden concerning up to 1.7 to 4.3 billion \$ in the US, and 355.06 Euros per patient per month in 2002 in Europe [12]. No data concerning the situation in Morocco was published.

The presentation of AR in childhood is more frequent in boys, but in adults, it is more common in women as found in our study [12].

The development of AR is related to risk factors that include a family history of atopy, a serum IgE greater than 100 IU/mL before the age of 6 and a higher socioeconomic class. The influence of other factors still unclear, like the early exposition to infections, animals and secondary smoking [12].

Considering the important genetic component of AR, the family history is an important parameter in the diagnosis, with a rate of 31,4% for AR, 21,4% for atopic disorders and 20% for allergic conjunctivitis in our study. In parallel, the ORA study (Observatory Allergic Rhinitis Study) fulfilled in France concerning the medical care of AR and published in 2011, found that in 50,7% of the cases, both parents had family history of allergy, 32,3% on the father side and 54,4% on the mother side [15]. It seems that children with a bilateral family history of atopy are more keen to develop symptoms more frequently and earlier than those with only a unilateral family history [16,17]. Also, the prevalence of AR in particular and allergies in general is higher in monozygotic twins than in the dizygotic ones [18].

The diagnosis of AR is based on the clinical presentation of the patient. According to the study of Charfi et al. the most frequent symptoms are rhinorrhea (38%), blocked nose (67%), nasal itching (48%), sneezing (72%) and smelling disorders (26,4%) [19]. These four first symptoms were reported in the totality of our patients, with a rate of 14,3% for smelling disorders, in addition to asthenia and nasal bleeding in 17, 1% of the cases and nocturnal awakening in 22,9%.

Further exploration can be performed without being neither systematic nor mandatory. A CBC can show a hyperosinophilia as found in 2 patients who did the test. Its prevalence can reach 59% in AR as shown in Rothenberg et al. study [20] and confirmed by Mudunuri et al. study [21] with a rate of 57%. Specific or total IgE dosing and multiallergenic tests can be considered. The hypereosinophilia can also be found on nasal cytology with a high prevalence, reaching 87% in Mudunuri et al. study [21].

The prick-test was done in 11,4% with a high specificity to indicate the causing allergen. It can test a large panel of allergens adapted to the local environment as shown in the Jaruvongvanich et al. thai study where the tests turned positive to dust mites mix, cockroaches mix, molds mix, cat dander, dog hair, and southern grass mix with rates of 85.4%, 59.2%, 13.1%, 9.2%, 1.9%, and 7.3% respectively [22].

The ARIA classified AR as “intermittent” if symptoms are present less than 4 days per week or for less than 4 consecutive weeks, and as “persistent” if symptoms are present more than 4 days/week and for more than 4 consecutive weeks. Also, symptoms are defined as “mild” if they do not cause any impairment in sleep and do no limit normal activities, and as “moderate/severe” if they significantly affect sleep, daily living, limit activities and are considered bothersome [4].

The World Health Organization defines Quality of Life as an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person’s physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment [12].

The impact of AR on QoL is proven and reaches high rates as between 35% and 50% of adults report that AR has at least a moderate effect on their daily life in the US, Latin America and Asia-Pacific surveys [12].

To evaluate the QoL in AR, two methods can be used: The general questionnaires measure the physical, psychological and social functions with no specificity for a particular pathology and are adapted to general population. The Medical Outcome Study Short Form 36, the Nottingham Health Profile, the Health Utility Index, the Functional Status Questionnaire and the Duke Health Profile had been used to evaluate the QoL in AR [23].

The specific questionnaires are based on interrogating patients with a specific pathology about its repercussion on their daily life and functioning. They are more precise and more sensitive and they are adapted to the tested population. For AR, the Standardized Rhinoconjunctivitis Quality of Life Questionnaire, the Mini Rhinoconjunctivitis Quality of Life Questionnaire, the Nocturnal Rhinoconjunctivitis Quality of Life and the Rhinoconjunctivitis quality of life (RQLQ) had been used [23].

The RQLQ is the questionnaire we chose for our study for its excellent performance in the large evaluating clinical studies, in the patients follow up and in the evaluation of the medical care. Besides, it had been used in many studies to evaluate the effect of nasal corticotherapy [24]. The questionnaire has been established by Professor Elizabeth Juniper. We used the validated Arabic version of Saudi Arabia [8].

It appears in our study that the most bothersome symptoms are the nasal symptoms represented by nasal congestion, rhinorrhea, nasal itching and sneezing (mean score =  $5,00 \pm 0,93$ ). As in Ciprandi et al. where the score for nasal symptoms is the highest, equal to  $4,8 \pm 0,8$  [25]. These results agree with literature where the nasal symptoms are reported as the biggest discomfort with also a significant impact on memory, learning and focusing. They generate a considerable physical and psychological inconvenience affecting daily and professional activities in more than 30% of cases. Furthermore, the repercussion on QoL is heavier especially when the patient is sensitized to more than two allergens and when the AR is persistent which illustrate the relationship between the clinical severity and the immune expression [26,27].

The score for general symptoms is up to  $4,63 \pm 1,39$  in our study versus a lower score in Ciprandi et al. paper which is up to  $3,8 \pm 0,6$  [25]. The patients with AR often report asthenia, reduced productivity and poor concentration, symptoms partly related to sleep disorders [25].

The quality of sleep is considered in our study “quite a bit troubled” with a score of  $4,20 \pm 1,75$  and “moderately troubled” with a score of  $3,9 \pm 0,7$  in Ciprandi et al. study [25]. Sleep disturbances include difficulty getting to sleep, waking up during the night and lack of a good night of sleep and a refreshed awakening. They can be explained by the nasal obstruction responsible of micro awakenings and hypopnea. A study by Léger et al. on the consequences of AR on quality of sleep showed a significant impact of AR on all dimensions of sleep quality and so, a lower QoL reflected by more somnolence; daytime fatigue and sleepiness; and impaired memory, mood, and sexuality, with a significantly increased consumption of alcohol and sedatives in cases compared with the control group. Also, the severity of AR influenced the mean duration of nocturnal sleep, the frequency of daytime sleepiness, the time necessary to fall asleep and the necessary intake of sedative drugs. Concerning the risk factors, the study reported the severity of AR which is highly correlated with all types of sleep disturbances, some concomitant medications that are linked to some types of sleep disorders as anxiolytic drugs with insomnia, male sex showed a significant correlation with sleep apnea, while asthma was correlated with severe insomnia [28].

The limitation of activity was considered “Quite a bit troubled” with a score of  $4,43 \pm 1,72$  as in Ciprandi et al. study that found a score of  $4,3 \pm 0,7$  [25]. The study of Meltzer et al. concluded that almost twice as many patients with AR compared with a control group consider themselves limited in daytime physical indoor activities (20% vs 11%) and outdoor activities (44% vs 21%) [29]. Also, a Spanish study reported that the negative impact on AR patients on daily activities was greater (27%) than for patients with type 2 diabetes mellitus (17%) and hypertension (9%) and it was less than for symptomatic depression (59%) [30]. On another hand, nasal inflammation and obstruction interfere

with the conditioning of inspired air by nasal turbinates and this may potentiate exercise-induced asthma symptoms [12].

The practical problems include the inconvenience of carrying tissues, the need to rub eyes and nose and the repeated need to blow the nose. These parameters had a score of  $4,29 \pm 1,97$  in our study, close to the score of  $4,1 \pm 0,9$  in Ciprandi et al. [25].

The ocular symptoms bothersome was ranked with a score of  $3,38 \pm 0,86$  in our study versus  $3,5 \pm 1,5$  in Ciprandi et al. study that highlight the importance of eye symptoms as they are frequently very annoying and bothersome [25].

The results for the emotional state in our study corresponded to a frequency of feelings of frustration, impatience, irritability and embarrassment “a good part of the time” ( $4,28 \pm 1,54$ ), a lower score was found on Ciprandi et al. up to  $3,9 \pm 0,8$  [25]. The US study by Meltzer et al. reported rates of 85% of fatigue, 67% of irritability, 60% of misery, 28% of depression, 25% of anxiety and 15% of embarrassment [29]. This impact can be explained by the allergic reactions triggering the immune system and cytokines and negatively affecting cognitive function [12].

This low physical and psychological QoL affects highly the professional performances. In the US, Latin America, and Asia-Pacific surveys, 10%, 4%, and 4%, respectively, of the workers reported absenteeism because of their nasal allergies; 22%, 17%, and 25%, respectively, reported work interference; and 20%, 16%, and 21%, respectively, experienced both. The estimation of loss of productivity was observed between 23% and 33% on bad AR days [12].

Also, in a younger population, as presented in a Swedish study, severe nasal symptoms of AR affecting the daily activities were linked to lower grades [31].

The impact of AR on sexual function is stated without being widely explored. The study of Kirmaz et al. showed an altered and diminished sexual activity in symptomatic periods of AR affecting desire, sexual arousal and orgasm in women, and desire but also erection and post coital satisfaction in men. Moreover, AR treatment appears to significantly improve the sexual function to a normal level [32].

Even though anosmia is a key symptom of AR, it doesn't belong to its classical symptomatology and only few studies have investigated and measured the olfactory function. According to Stuck et al. the prevalence of smelling disorders in AR varies between 10 and 88% while the majority of authors report it in the range of 20–40%. Also, the frequency of olfactory dysfunction increases with the duration, severity and evolution of the pathology [33]. It is still an interesting parameter to explore considering its influence on patients QoL, by disturbing their ability to taste, losing their pleasure of eating and increasing risks such as not noticing leaking gas. Smelling disorders can be caused by the obstruction of the olfactory cleft due to congestion of nasal mucosa or dysfunction of the olfactory bulb form local inflammation [12].

Overall, the global score of QoL in our AR population was up to  $4,28 \pm 0,84$  corresponding to “Quite a bit troubled”. In parallel, on Ciprandi et al. study the global RQLQ score was computed to be  $4,0 \pm 0,7$  [25]. On the Meltzer et al. study, AR patients reported their overall sense of their health as excellent (11%), versus 23% in the non AR group, very good (29%), good (34%), fair/poor/very poor (27%) versus 15% in the non AR group; clearly showing that the AR patients rated their global QoL lower [29].

In our study, all the symptoms and the overall QoL improved significantly after 3 months of nasal corticotherapy based on budesonide. The same results are found in Detineo et al. study which showed a betterment of the QoL parameters individually and globally under the same treatment [34]. Otherwise, Kristal et al. work compared between a group of AR patients treated by budesonide and another one treated with a placebo. The two groups observed significant improvement in the RQLQ global score after 2 and 4 weeks [35]. Moreover, in another Ciprandi et al. essay, the physical items of the RQLQ were significantly improved while the emotional state was improved with no significant result [36].

A study was fulfilled by Brett *et al.* comparing between different nasal corticosteroid molecules. The budesonide appears well tolerated, financially accessible and as efficient as Fluticasone, with a comparable efficiency as mometasone with even lower doses [37].

## 6. Conclusion

AR is a chronic pathology considered as a true public health problem considering its high prevalence and its important impact on the patient quality of life and productivity.

The treatment is mainly based on long term nasal corticotherapy and shows a significant improvement of the symptomatology and its repercussion.

## Ethical approval

I certify that this kind of manuscript does not require ethical approval by the Ethical Committee of our institution.

## Author contribution

A. Chaouki: conception and design of the study, A. Mkhatri: conception and design of the study, K. El Bouhmadi: drafting the article, S. Rouadi: revising the article, Y. Oukessou: acquisition of data, R. Abada: revising the article, M. Roubal: revising the article, M. Mahtar: final approval of the version to be submitted.

## Consent

Written informed consent was obtained from the patients for publications of this research study. A copy of the written consent of each patient is available for review by the Editor-in-Chief of this journal on request.

## Registration of research studies

Name of the registry: [www.researchregistry.com](http://www.researchregistry.com).  
Unique Identifying number or registration ID: researchregistry6028.  
Hyperlink to your specific registration (must be publicly accessible and will be checked):  
<https://www.researchregistry.com/browse-the-registry#home/registrationdetails/5f625a8a4518950018a0da03/>

## Guarantor

A. Chaouki.

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## Declaration of competing interest

The authors declare that they have no competing interests.

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.amsu.2020.10.043>.

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