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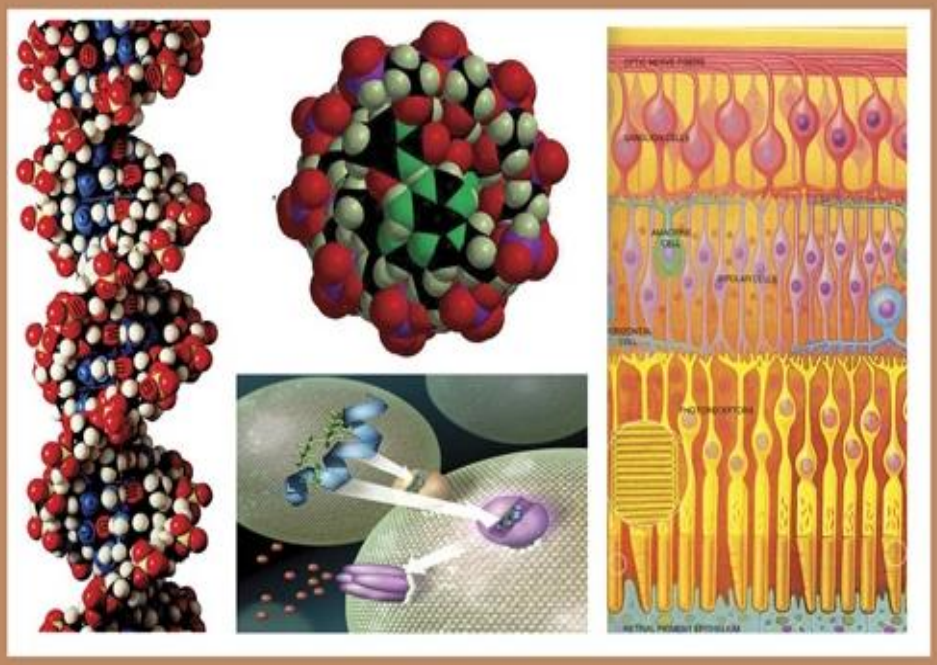

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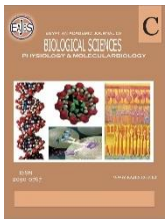

The Use of *Syzygium aromaticum L.* to Avoid and Control the SARS-CoV-2 Related Complications

Mellali Sarah[1*], Haoud Khadidja[2], Dermeche Keltoum[1], Tamert Asma[1]and Aroussi Abdelkrim [1].

1-Department of Biological Sciences, Faculty of Science and Technology, Relizane University, Relizane, Algeria.

2-Department of Biology, Faculty of Natural and Life Sciences, Djillali Liabes University, Sidi Bel Abbes, Algeria

*E. Mail: sarah.mellali@univ-relizane.dz

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ABSTRACT

***Objective*:** As part of the fight against COVID 19, various phytochemicals obtained from medicinal plants and natural products are being explored as alternative and complementary solutions to treat contaminated patients. The current study aimed to evaluate the efficacy of one of the most popular: clove or "*Syzygium aromaticum* L."

Materials and Methods: In this sense, we conducted a cross-sectional descriptive study of 100 patients between the ages of 21 and 80, diagnosed positive for Covid-19, between October 2020 and January 2021, and administered between 2 and 3 clove buds, twice daily.

Results and discussion: Our study revealed that patients between the ages of 30 and 39 were the most affected, with women being the predominant (75%). The scanner showed a moderate Covid-19 attack (10-25%) in 72% of patients. Dried clove was used by 85% of patients, 81% of them noted an improvement in their overall condition after 48 hours of treatment. The use of clove is relatively significant with disease progression ($p < 0,05$). Indeed, complications were observed in the group of patients who did not use this medicinal plant.

Conclusion: Clove appears to be effective in the fight against COVID-19. It can be used to prevent and control symptoms associated with SARS-CoV-2.

INTRODUCTION

Over the past 20 years, the world has witnessed several viral outbreaks that posed serious threats to public health, including the Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-1). In 2003, the H1N1 swine flu in 2009, and the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012 (Derosa *et al.*, 2021).

At the end of 2019, a novel coronavirus, Acute Acute Respiratory Syndrome Coronavirus 2 (Sars-CoV-2), was discovered on patients with unexplained severe pneumonia in Wuhan, China (Wang et *al.*, 2020; Haoud and Mellali, 2021).

In February 2020, the World Health Organization (WHO) designated this new virus's sickness as "COVID-19", and proclaimed COVID-19 a global pandemic on 11 March 2020 (Derosa *et al.*, 2021).

SARS-CoV-2 is a Betacoronavirus with a single strain of RNA virus containing approximately 30 KB of genomes. The virion of coronaviruses has between 80 and 160 nm in diameter, and the surface appeared club-shaped spikes of protein, which mimic the solar corona (Pal *et al.,* 2020).

In addition to lung involvement, SARS-CoV-2 affects the kidneys, liver, cardiovascular and neurological systems (Haoud and Mellali, 2021), and it is responsible for a high mortality rate ranging from 5.8% to 11.7% (Cui *et al.,* 2021).

After about five days of incubation, 70% of infected patients experience fever, cough, or dyspnea. In some patients, an inadequate immune response occurs in the form of inflammatory syndrome and deterioration of respiratory symptoms, eight to ten days following the onset of symptoms. This dysimmune phase, also known as a cytokine storm, can be linked to coagulopathy and the set indicating viral septicemia (H. Li *et al.,* 2020).

Since the onset of the new pandemic, a number of countries have looked into phytochemicals derived from medicinal plants and natural products as potential treatments for COVID-19 patients using herbal therapy (Aanouz *et al.,* 2021).

Indeed, many products were tested *in silico* and have proven effective against SARS-CoV-2, which could be a preventive and supportive treatment to control and mitigate organ damage caused by COVID-19 (McKee *et al.,* 2020; Haoud and Mellali, 2021). Furthermore, for a long time, herbal treatments were recognized as a primary source of novel pharmacological compounds for the prevention and treatment of viral infections (Astani *et al.,* 2011). There are various plants, which have antiviral and immunomodulatory properties, including *Syzygium aromaticum L, Glycyrrhizaglabra,Azadirachtaindica, Andrograp hispaniculata, Calotropisgigantea, Ocimumsanctum, Curcuma longa, Withaniasomnifera, Zingiber officinale, Allium sativum, Tinosporacordifolia* and *Moringaoleifera* (Dhama *et al.,* 2018; El-Saber Batiha *et al.,* 2020).

Among the spices, Clove has gotten a lot of attention, because of its powerful biological activities, especially the antimicrobial and antioxidant activities (Shan et *al.,* 2005). *Syzygium aromaticum L.,* widely known as clove, is a dried flower bud of a tree in the Myrtaceae family (Cortés-Rojas *et al.,* 2014). For centuries, clove was a remedy for a variety of health problems, including its antiviral, anesthetic, antimicrobial, stimulant, antifungal and antiseptic properties (Bhowmik *et al.,* 2012).

Our aims work was to evaluate the efficacy of clove *"Syzygium aromaticum L."* in patients with COVID-19. To this end, we have documented patient demographics, symptoms, laboratory results and drug administration data.

MATERIALS AND METHODS

We did a cross-sectional descriptive, retrospective statistical study at the Covid-19 services in the Mohamed Boudiaf hospital and Ahmed Francis hospital, oued rhiou of the Relizane region (Algeria), using an anonymous questionnaire. This study took place over a three-month period, from October 2020 to January 2021.

This study was carried out on 100 patients diagnosed as positive for COVID-19 and aged between 21 and 80 years old. Our sample consisted of 75 women and 25 men.

For each patient, we studied the following parameters: Socio-demographic and anthropometric criteria including sex, age, height and weight and body mass index (BMI), the clinical characteristics of COVID-19. The diagnostic tools in our study were the chest scanner and reverse

transcription-polymerase chain reaction (RT-PCR) …

The diagnosis of COVID-19 in Algeria is based on real-time RT-PCR, the principle of which is based on the reverse-transcription of viral RNA to a DNA molecule that would then be amplified to be detectable. The chest scanner is also used in the diagnosis of COVID-19, the scanner uses X-rays that reveal the lung lesions characteristic of COVID-19.

Treatment and Medicinal Plants Used:

In Algeria, COVID-19 patients are treated according to azithromycin and hydroxychloroquine-based protocols as recommended by the Ministry of Health and Hospital Reform of Algeria (2020). Most patients, whose symptoms persisted even after the use of the treatment prescribed by the doctor, used traditional medicine in parallel, using dry *Syzygium aromaticum L.*, the latter was obtained from the market and identified by our research team.

The dose of clove administered ranged from 2 to 3 buds, on average twice daily for the duration of treatment. This is a loading dose since the disease is fatal and we did not have enough time to try different doses. The clove method most commonly used by patients in this study was perfusion (59%) and fumigation (41%).

Statistical Analysis:

The IBM® Spss®statistics(version 23.0) software was used to analyse the collected data. The graphical representations were produced by Microsoft Office Excel 2010. The results were expressed as a percentage of the qualitative variables and as an average standard deviation of the mean of the quantitative variables. Frequencies, mean and median were calculated using the Khi 2 test for qualitative comparison. The link between the qualitative variables was achieved using Pearson Khi 2 test, the P-value that is less than or equal to 0.05 was found to be significant.

RESULTS

Our study included a total of 100 COVID-19 patients. The average age was 35,24 ± 10,76 years and the age group between 30 and 39 years was the most represented, with a female predominance (75%) and a sex ratio (H / F) of 0.33. The characteristics of our patients are summarized in Table 1.

According to the scanner results, a moderate attack (10 - 25%) by Covid-19 was observed in 72 % of cases (Fig. 1). The epidemiological data of our patients are summarized in Table 2.

Dried clove was used by 85% of patients. More than half of the users (52%) noticed an improvement in their condition and found this plant to be very effective, 29% of patients found average effectiveness. An improvement in the general condition after 48 hours of treatment using clove, with the disappearance of most symptoms, including fever, body pain, difficulty breathing and coughing (Fig. 2).

In our study, 18% of patients with COVID-19 developed a complication disorder, while 82% of patients had a good disease progression (Fig. 3).

The most common complication observed in our study was a secondary infection in 77,8% of cases, followed by respiratory distress (27,8%), pulmonary embolism (11,1%), and kidney failure (5,6%) (Fig. 4).

The study found a statistically significant relationship between clove use and disease progression with a $p < 0.05$. Indeed, complications were observed in most patients who did not use this medicinal plant (Figs. 5 and 6).

Table 1: the characteristics of the patients recruited in our study.

Age	**Age interval (years)** **average age (years)** **median (years)**	**[21-80]** **35,24 ± 10,76** **32**
Age range (years)	20 à 29 ans 30 à 39 ans 40 à 49 ans 50 à 59 ans 60 à 69 ans ≥70 ans	34,0% 43,0% 12,0% 7,0% 3,0% 1,0%
Sex	Men Women	25,0% 75,0%
Body Mass Index (BMI) (kg/m^2)	Underweight Normal weight Overweight	14,0% 72,0% 14,0%
medical antecedents	Type 2 diabetes endocrine disease heart disease and hypertension autoimmune disease Respiratory and allergic disease	8% 2% 9% 3% 6%

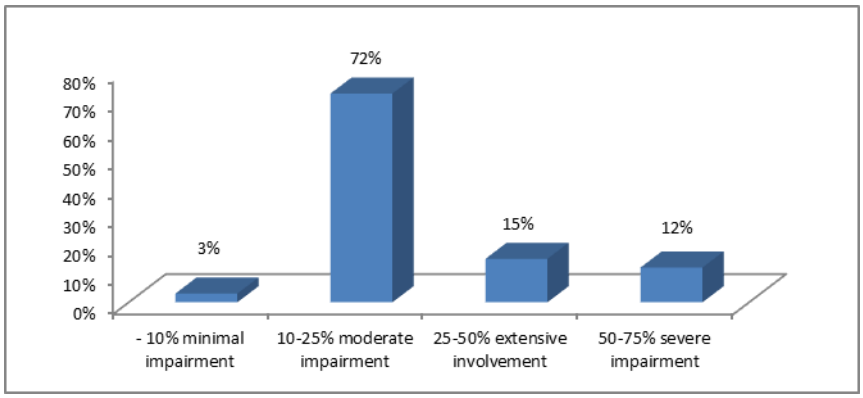

Fig.1: Distribution of patients by computerized tomography (CT) scan result.

Table 2: Epidemiological and clinical characteristics of our population.

Symptoms	Fever Sore throat Tiredness Loss of taste or smell Muscle aches Stuffy or runny nose Dry cough Breathing difficulties/dyspnea Headache Insomnia Diarrhea Nausea	84,0% 42,0% 79,0% 65,0% 47,0% 31,0% 66,0% 25,0% 61,0% 20,0% 41,0% 22,0%
Treatment used	antibiotic therapy chloroquine Vitamin therapy Zinc Lovenox	83% 9% 86% 65% 26%
Use of cloves	Yes No	85% 15%

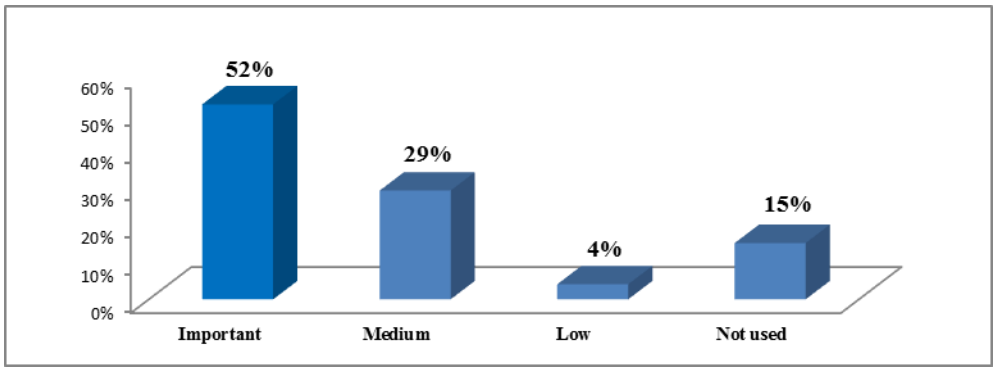

Fig. 2: Distribution of patients according to the efficacy of clove.

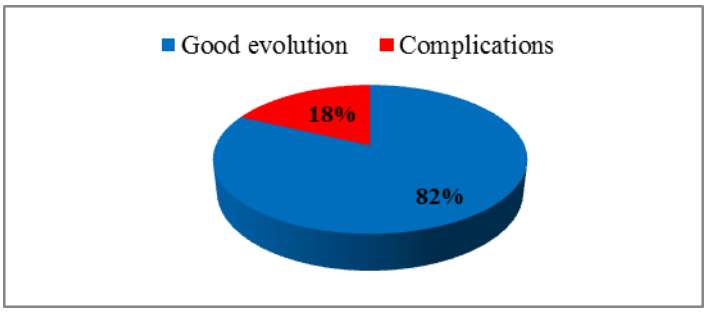

Fig. 3: Distribution of patients according to the course of the disease.

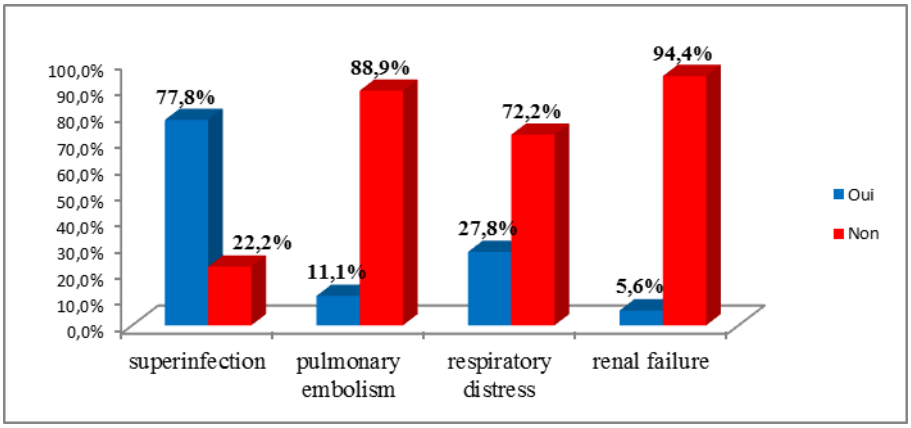

Fig. 4: Distribution of patients by type of complication.

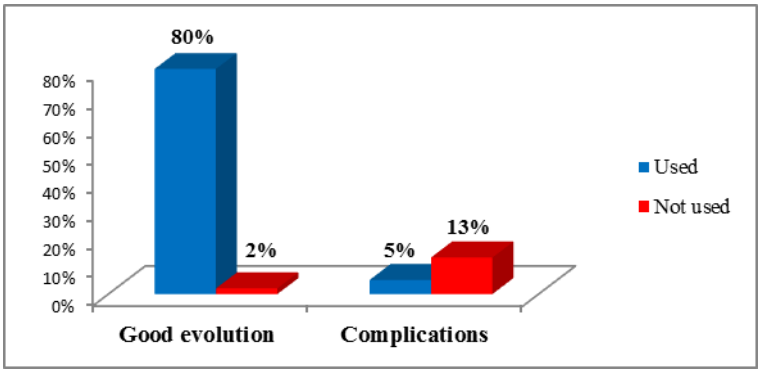

Fig. 5: Distribution of patients according to the evolution of treatments and the use of cloves.

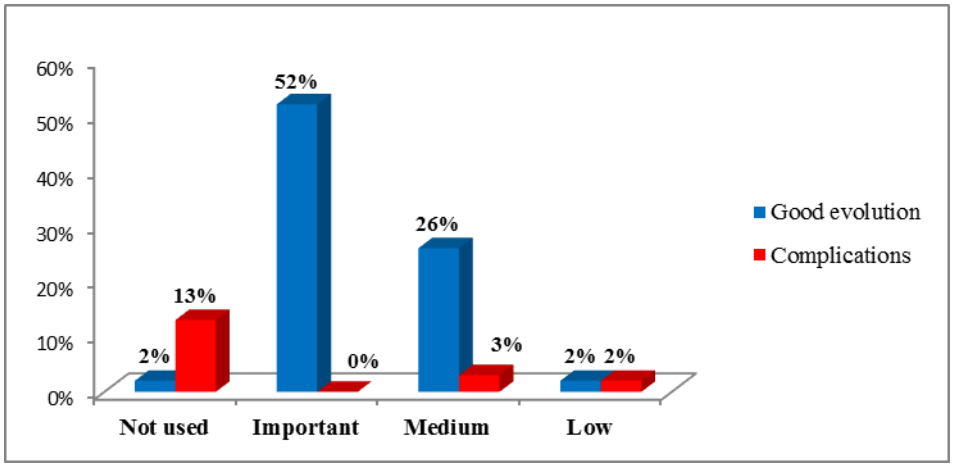

Fig. 6: Distribution of patients according to the evolution of treatments and clove efficacy.

DISCUSSION

Our study conducted on COVID-19 patients found that the average age was 35,24 ± 10,76 years and the median age was 32 years with an interquartile range (IQR) of 29 to 39 years. The age group between 30 and 39 years was the most affected by the new virus, and only 10 % of our patients were over the age of 50 years old.

Our results were similar to a study in Pakistan of 194 cases, whose median age was 34 years, with an IQR of 27 – 48 years (Ahmad *et al.,* 2021). Lastly, a multicenter European study found that the average age of patients was 36,9 ± 11,4 years (Lechien et *al.*, 2020). This can be explained by the fact that the Algerian population is a young population. In fact, according to the National Statistical Office's (2018) census of the Algerian population, 30,1% of the country's population is under the age of 15 and only 9,3% of the total population is over the age of 60 years. However, the median age was lower than the outcome reported by other researchers in Wuhan, China: Huang et *al.* found the median age to be 49 years (Huang *et al.*, 2020), The median age was reported to be 56 years by Wang et *al.* (Wang *et al.,* 2020) and 55,5 ± 13,1 years by Chen et *al.* (Chen et *al.*, 2020).

The occurrence of COVID-19 among women (75%) was higher than among men, with a male-to-female ratio (M/F) of 0,33, suggesting that women could be at higher risk of getting COVID-19. In line with our data, a recent COVID-19 study by the Korean Society of Infectious Diseases of 4212 patients, found that 62,3% of infected patients were women and only 37.7% were men. Another European multicenter COVID-19 study of 417 patients also revealed a female predominance (63%) (Lechien *et al.*, 2020).

According to some research, gender discrepancies in COVID-19 may be due to social and cultural variations between nations (Kopel et *al.*, 2020). However, these results contrast with other studies that showed male predominance: Huang et *al.* (73.0 %) (Huang *et al.*, 2020), Wang et *al.* (54.3%) (Wang et *al.*, 2020) and Zhang et *al.* 50.7% (Zhang *et al.*, 2021).

Differences in COVID-19 sensitivity and progression between female and male patients can be explained by the fact that women secrete type 1 interferon (IFN) in larger proportions than men, a powerful antiviral cytokine, when viral RNA is detected by toll-like receptor 7, which is essential for the early reaction to SARS-CoV-2 virus (Peckham et *al.*, 2020).

In addition, *in vivo* assays of the angiotensin-converting enzyme 2 (ACE2), which is the primary receptor of viral entry into cells, revealed that male patients had

greater kidney expression of ACE2 than female patients. However, However, it is currently unknown if ACE2 expression in the lungs of female and male patients differs (Kopel *et al.,* 2020). A recent COVID-19 study found that Men had greater severity and fatality rates than women. In fact, a study conducted in China found that COVID-19 caused twice as many deaths in males as it did in women (Jin *et al.,* 2020). High oestrogen levels in COVID-19-positive women are likely to reduce the severity and mortality of COVID-19-related fatalities, by increasing the humoral and innate response (Kopel *et al.,* 2020).

The majority of patients were normal weight (72%), and only 14% were overweight. Obesity, on the other hand, appears to be a risk factor for severe COVID-19 and mortality in some studies. In fact, obesity induces a pro-inflammatory state that leads to increased sensitivity to a number of respiratory viruses (Lighter *et al.,* 2020).

Our findings revealed that 28% of COVID-19 patients had a medical history that included cardiovascular disease and hypertension, type 2 diabetes, respiratory and allergic diseases, autoimmune diseases and endocrine diseases. Similar studies found that hypertension was the most common comorbidity, followed by diabetes, heart disease and respiratory disease (Yang *et al.,* 2020; Ahmad et *al.,* 2021; Naveed *et al.,* 2021). In addition, patients with a serious medical history such as hypertension, heart disease, diabetes mellitus, lung disease and cancer, are also at a greater risk of COVID-19 severity and fatality (Yang *et al.,* 2020; Naveed *et al.,* 2021). Several standard characteristics are common between infectious disorders and chronic diseases, such as pro-inflammatory status and a weakened innate immune response, which can make patients more susceptible to disease complications (Yang *et al.,* 2020).

Chest CT (Computed Tomography) is a critical and fast imaging tool, for identifying patients infected with COVID-19, primarily in developing countries, where PCR testing is expensive and the number of PCR kits available is limited. According to our CT results, most COVID-19 patients in our study (72%) had a moderate attack (10 - 25%) and only 12% had a severe impairment (50 - 75 %). A Chinese study included 1014 patients; found that chest CT had 97% sensitivity, 25% specificity, a positive predictive value up to 65 % and a negative predictive value up to 83% (Ai *et al.,* 2020). The most common symptoms observed in our study were fever (84 %), followed by fatigue and dry cough. A study of 138 infected patients, reported a similar set of signs and symptoms (Wang et *al.,* 2020). In addition, a recent meta-analysis of seven studies involving 1,576 infected patients found that fever was the most common clinical symptom (91,3%), followed by cough (67,7%) and tiredness (51%) (Yang *et al.,* 2020). Remarkably, 65% of our patients have experienced a loss of taste or smell, which can be a significant predictor of a viral infection with SARS-CoV-2 (Callejon-Leblic et *al.,* 2021). However, other researchers reported that 4,12% of patients remained asymptomatic (Ahmad *et al.,* 2021).

The most commonly used treatment in our study was antibiotic therapy for infections (83%) followed by vitamin therapy to strengthen the immune system (86%). Only 9% of our patients received antivirals treatment (chloroquine). Nevertheless, the study by Wang et al. confirmed that no effective results were observed using antiviral therapy; even, antibacterial agents were ineffective (Wang *et al.,* 2020).

Currently, anti-COVID-19 approaches include the control of source infection, utilizing personal protective precautions to decrease the risk of transmission, supportive therapies for infected individuals, isolation, and early diagnosis (Wang *et al.,* 2020; Wu *et al.,* 2020).

Use of *Syzygium aromaticum L.*:

In our study, 85% of patients had persistent symptoms and had a low response to recommended treatment. The majority had resorted to the use of *Syzygium aromaticum L.* Indeed, for centuries, cloves were used in traditional medicine as a cure for a number of health conditions. In fact, the active principles in clove have anaesthetic, antiviral, antimicrobial, antifungal, antioxidant, antiseptic, anti-inflammatory and local immunostimulant properties (Bhowmik et *al.,* 2012; Lobstein *et al.,* 2017).

Cloves are currently utilized in three main forms: dried entire bud, essential oil and powdered spice. All forms have the same significant biomedical properties; however, the potency degree varies, with the oil having the maximum potency. Dried entire buds have a medium potency (still containing a significant quantity of oil). Finally, ground cloves are the least potent of all the clove varieties (cloves lose the majority of its essential oil in this form) (Bhowmik *et al.,* 2012).

Clove essential oil is commonly used in dental care, as well as in burns, the treatment of gum infections, digestive and respiratory diseases, as anticancer, antiangiogenic and for its antimutagenic activities (Aisha *et al.,* 2012; El-Saber Batiha *et al.,* 2020). Cloves also have the advantage of being inexpensive and widely available in markets around the world.

In agreement with previous studies on the remarkable properties of clove, 81% of our patients confirmed that this medicinal plant has significant or moderate efficacy, with an improvement in the general condition after 48 hours of treatment and the disappearance of most symptoms, including fever, body pain, breathing difficulties and coughing. Phytochemical studies on cloves have shown that dried buds enclose up to 20% of essential oil, which is mostly composed of eugenol (a major bioactive molecule representing 70 -90%), β-caryophyllene, eugenyl acetate and various sesquiterpenes (El-Saber Batiha *et al.,* 2020).

Moreover, other constituents containing smaller amounts have been identified, such as gallotannic acid, Crategolic acid, methyl salicylate, vanillin, rhamnetin, kaempferol,eugeniin, eugenitin, methyl amyl ketone, oleanolic acid, methyl salicylate, α- and β-humulene, benzaldehyde, β-ylangene, chavicol (Mittal *et al.,* 2014), bicornin and biflorin (El-Saber Batiha et *al.,* 2020).

In addition, cloves are rich in minerals including potassium, manganese, magnesium, selenium and iron (Bhowmik *et al.,* 2012). Cloves are also a rich source of vitamin A and beta-carotene, both of which are known to have antioxidant properties. It contains very good amounts of vitamin C, which helps the body to develop resistance to infectious agents and is utilised by cells to recover dangerous free oxygen radicals. Clove also contains vitamin K, vitamin B1, vitamin B6 and riboflavin (Bhowmik *et al.,* 2012; El-Saber Batiha *et al.,* 2020).

It should be noted that inhalation of the odour produced by hot clove tea is also a popular method of using clove bud for respiratory disorders, such as coughing, colds, asthma, bronchitis and sinusitis. Furthermore, cloves are known to be antispasmodics in topical application, to relieve muscle spasms or in a tea to relieve cough; it is also used as a remedy against headache (Bhowmik *et al.,* 2012). Eugenol, the main component of cloves, has shown strong antibacterial efficacy against Gram-negative, Gram-positive and acid bacteria, along with fungus (El-Saber Batiha *et al.,* 2020).

On the other hand, due to the prevalence of inflammatory cytokine storms and weakened immune systems in individuals with severe COVID-19, many studies have recommended dual therapy for SARS-CoV-2 with anti-inflammatory and antiviral properties (Naveja *et al.,* 2021). As recommended in the literature,

Syzygium aromaticum L. appears to be good therapy for COVID-19.

Eugeniin is another interesting clove compound, with antiviral efficacy against several strains of the hepatitis C virus and the herpes virus. Eugeniin blocks the viral DNA polymerase enzyme, which prevents viral DNA from being synthesized (Hussein *et al.,* 2000). Eugenol has also been demonstrated to have antiviral properties against herpes simplex 1 (HSV-1) and HSV-2, decreasing viral reproduction and lowering viral infection (Reichling *et al.,* 2009). Moreover, anti-inflammatory activities are also associated with the active compound, eugenol, as well as, immunomodulatory activities by suppressing the action of lipopolysaccharide (LPS) and the kB nuclear factor (NF-kB) pathway (Han and Parker, 2017).

It is likely that eugenol regulates cellular inflammatory cascades and prevents prostaglandin production and neutrophil/macrophage chemotaxis, along with cyclooxygenase II enzymatic expressions. Additionally, eugenol dimers may inhibit cytokine expression in macrophages (Mohammadi Nejad *et al.,* 2017). All these data allow us to affirm that cloves can act on the main symptoms of SARS-CoV-2 infection by their antiviral, antispasmodic, anti-inflammatory, and antibacterial properties.

Indeed, in our study, 82% of patients had a good disease course, compared to only 18% who developed a complication including superinfection, respiratory distress, pulmonary embolism and Kidney failure. Cloves are well known for their ability to stimulate the human immune system and to improve disease resistance (Bhowmik *et al.,* 2012). The immunostimulant property has been linked to the improvement of cellular and humoral immune response mechanisms caused by the essential oil of clove.

Noteworthy, after the administration of clove essential oil in immunosuppressed cyclophosphamide mice, a dose-dependent improvement of both cellular and humoral immune responses was reported (Carrasco *et al.,* 2009).

Our study found a statistically significant relationship between clove use and disease progression with a $p < 0.05$. Indeed, complications were recorded in most patients who had not used this medicinal plant. Phytocompounds derived from cloves have been recommended as strong anti-SARS-CoV-2 medicines in several *in silico* screening studies of natural compounds for COVID-19 (Joshi *et al.,* 2020).

Indeed, it has been shown *in silico* that, kaempferol binds the substrate-binding pocket of the main protease of SARS-CoV-2, with a strong affinity, interacting with residues, including His41 and Cys145, by hydrophobic interactions and hydrogen bonds, implying that clove flavonoids may work as new SARS-CoV-2 inhibitors. In silico studies revealed that clove compounds, such as biflorine and bicornin, had a strong affinity for Mpro (the main protease), indicating that these compounds may have inhibitory effects (Rehman *et al.,* 2020).

All these data highlighted in our study suggest the probable potential of clove in the fight against COVID-19 in combination with conventional treatments.

Toxicity and Contraindications:

Clove oil, clove buds, eugenol, and other clove components have been found to be safe as a dietary supplement by the American Food and Drug Administration (FDA) (Vijayasteltar *et al.,* 2016). However, WHO recommends an adequate daily consumption of 2.5 mg/kg body weight (Ogunwande *et al.,* 2005). It should be noted that the use of clove oil is strongly not recommended for patients treated with an anticoagulant or antiplatelet agent, due to the possible risk of bleeding. The use of cloves should be avoided in children less than 12 years old and patients with liver failure, as well as

pregnant and lactating women (Lobstein *et al.*, 2017).

Limitations of the Study:

The number of patients participating in the study is relatively low. Unfortunately, another limitation was the absence of a control group to compare clinical progress in these patients with other patients not receiving cloves.

CONCLUSION

Syzygium aromaticum L. is traditionally used in the treatment of respiratory diseases for its antiviral properties towards a variety of viruses, as well as its anti-inflammatory, antibacterial, immunostimulant and antithrombotic characteristics. Clove appears to be effective in controlling and mitigating symptoms related to COVID-19 with an improvement in the overall condition after 48 hours of use. It is a very interesting and promising medicinal plant, that can be used to prevent and control complications associated with SARS-CoV-2. However, it is advisable to consume cloves in appropriate doses. In light of these encouraging results, further pharmacological studies on this medicinal plant are recommended, in order to improve the results of this research.

Ethics Approval: The local Ethics Committee of University Hospital has approved our study.

Conflict of Interest: No conflict of interest is declared.

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ARABIC SUMMARY

استخدام القرنفل لتجنب المضاعفات ذات الصلة بفيروس سارس-كوف-2، والسيطرة عليها

ملالي صراح [1], حوض خديجة [2], درماش كلتوم [1], تامرت أسماء[1] , عروسي عبد الكريم [1]
1قسم العلوم البيولوجية، كلية العلوم والتكنولوجيا، جامعة غليزان
2 قسم البيولوجيا، كلية علوم الطبيعة والحياة جامعة، جيلالي اليابس سيدي بلعباس

الهدف: كجزء من مكافحة كوفيد 19، يجري استكشاف مختلف المواد الكيميائية النباتية التي يتم الحصول عليها من النباتات الطبية والمنتجات الطبيعية كحلول بديلة وتكميلية لعلاج المرضى المصابين. الدراسة الحالية تهدف إلى تقييم فعالية واحد من الأكثر النباتات الطبية شعبية: القرنفل
من أجل ذلك، أجرينا دراسة وصفية شاملة على 100 مريض مصاب بالكوفيد 19, تتراوح أعمارهم بين 21 و80 عاماً، في الفترة الممتدة بين أكتوبر 2020 ويناير 2021، وتلقوا ما بين 2 و3 حبة قرنفل، مرتين يومياً.
النتائج والمناقشة: كشفت دراستنا أن المرضى الذين تتراوح أعمارهم بين 30 و39 عاماً كانوا الأكثر تأثراً، وكانت النساء أكثر المرضى اصابة (75%). أظهر نتائج الأشعة المقطعية وجودا معتدلاً لفيروس كوفيد 19 (10-25%) في 72% من المرضى. تم استخدام القرنفل المجفف من قبل 85 ٪ من المرضى، لاحظ 81 ٪ منهم تحسن في حالتهم الإجمالية بعد 48 ساعة من العلاج. استخدام القرنفل كان مهم نسبيًا مع تطور المرض (**p <0,05**). في الواقع، لوحظت مضاعفات في مجموعة المرضى الذين لم يستخدموا هذا النبات الطبي.
الخلاصة: يبدو أن القرنفل فعال في مكافحة كوفيد 19. يمكن استخدامه للوقاية من الأعراض المصاحبة لفيروس سارس كوف 2 والسيطرة عليها.
الكلمات الرئيسية: كوفيد 19، قرنفل، فعالية ، دراسة وصفية.