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## Original Research Article

# Combined therapy of acute respiratory viral infections, including coronavirus infection, using a specialized mattress in the background

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## ABSTRACT

**Background:** Acute respiratory viruses are associated with lower respiratory tract diseases, providing an essential load on the public health system worldwide. Acute respiratory tract infections can be caused by many different viruses, and no approved vaccines or medicines exist for most of them. New approaches to respiratory infection treatment complement the molecular methods by focusing on improving the quality of daily life stages. One of the most important stages is sleep, which is associated with the overall organism restoration and, therefore, is critical to the recovery efficacy. We consider a specialized mattress with a bioactive vicuna cover as a facility improving the sleep quality and estimate its influence on the respiratory infection dynamics for patients under treatment by conventional medication.

**Methods:** Data from 24 patients with the acute respiratory viral infection were collected in the 5 day period, during which they were treated with conventional medication and were sleeping either on the specialized mattresses or on regular mattresses. The patients were split into four groups depending on the mattress type and information that they had about that type, under the double-blind experiment setup. The data comprised the dynamics of several symptoms of the disease, including fever, headache, cough, mucosal hyperemia, and others.

**Results:** Patients with the acute respiratory viral infection demonstrated faster recovery under conditions of sleeping on the specialized mattresses, as compared to the patients who were sleeping on regular mattresses. This difference in the recovery rate was observed for all considered symptoms of the disease, with the largest difference exhibited by nasal congestion (33% difference in the rate between the specialized and regular mattress groups), cough (25%), and rheum (25%). The control for the placebo effect did not reveal its essential influence for most symptoms.

**Conclusions:** The specialized mattresses with the bioactive vicuna cover can effectively be used by patients with the acute respiratory viral infection in addition to conventional tools and medicine. Sleeping on these mattresses alleviate the dynamical state of patients with the disease and facilitates in relieving patients of the symptoms.

**Keywords:** Respiratory virus, Acute respiratory infection, Bioactive vicuna mattress cover, Specialized mattress, Sleep quality

## INTRODUCTION

Epidemics of acute respiratory viral infections (ARVIs) are persistent in human populations.<sup>1</sup> They are associated with an essential mortality rate and cause tremendous costs in public health systems.<sup>2,3</sup> The pool of pathogens

causing respiratory infections is very heterogenous, which hampers the progress of finding vaccines and medicine.<sup>4</sup> As the natural variability of the respiratory viruses puts an inevitable constraint on the molecular methods for the targeted drug design, complementary approaches should also be considered.<sup>5</sup> An evident target

for such approaches is the ability of a patient to mobilize the body resources to support the recovery process. The quality of conventional daily life experience of a patient with ARVI, including good sleep, balanced ration, and minimal stress conditions, is a prerequisite for more efficient cure.

Conditions of sleep influence both mental and physical health and can be of special importance for patients whose organism is struggling with infection. The specialized mattresses covered by bioactive vicuna (bioactive vicuna specialized mattresses, or BVSM) are an efficient facility providing good quality of sleep. They were shown to be effective for patients with various sleep disorders, including insomnia.<sup>6,7</sup> In this study, we investigate a possible effect of the sleep quality improvement on the ARVI dynamics.

## METHODS

### *Study type and selection criteria of patients*

The study type is randomized controlled trials, in which the influence of the BVSM usage was tested during the ARVI treatment. It was carried out in the sports medicine clinics of the Russian state university of physical education, sport, youth, and tourism (Moscow, Russia), in collaboration with the small innovative company “Telebiomet” from the Moscow technical university of communications and informatics. The study lasted from 1 June to 5 June 2020.

Selection criteria of the patients were as follows; 24 patients having ARVI and not having other concomitant diseases were chosen. It was controlled that the patients had the same date of symptom appearance and same starting date of the medication treatment course, in order to ensure they were approximately at the same time point of the recovery dynamics in the beginning of the study. No other constraints were used in the selection procedure.

ARVI was defined as any combination of the following symptoms: fever, headache, cough, general weakness, nasal congestion, rheum, sore throat, and mucosal hyperemia. In addition to these symptoms, the breathing difficulty was subjectively assessed by each patient. The presence of each symptom for each patient was recorded at the beginning of the study and after 5 days of treatment with conventional medication accompanied with specific sleeping conditions, under the double-blind experiment setup, as described further. The patients had various respiratory viral infections, including influenza A and B, human coronavirus, and some others.

### *Study procedure*

A total 24 selected patients with ARVI were equally split into four groups (6 patients per group). The first group

comprised patients who were sleeping on the BVSM during the study and were truly informed about this fact. The second group comprised patients who were sleeping on the BVSM during the study but were informed that they were sleeping on regular mattresses. The third group comprised patients who were sleeping on regular mattresses during the study and were truly informed about this fact. The fourth group comprised patients who were sleeping on regular mattresses during the study but were informed that they were sleeping on the BVSM. Therefore, the second group was aimed to represent a possible influence of the BVSM under no a priori expectations, and the fourth group was aimed to represent the placebo effect. The viral infections detected in patients were distributed uniformly across the four groups.

In the course of the study, all patients were treated with the antiviral drug Kagocel® and additional supporting medicine, as described in detail elsewhere.<sup>8</sup> In addition to that, during all 5 days of the study each patient was sleeping on a mattress, either on the BVSM or on regular mattress depending on which group that patient belonged to. The patients used their mattresses for sleeping during the rest hours in the hospital. The dynamics of the ARVI symptoms for each patient was recorded during these 5 days.

### *Details on the specialized mattress*

We improved the quality of sleep of patients from the first and second groups by means of the BVSM produced in Malaysia.<sup>6,7</sup> The mattress cover is made of ingredients which are a mixture of cotton fabrics and polyester microtexture. A layer of a specialized substance was spread on the mattress cover with the subsequent procedure of drying. The specialized substance contains the following components; deep sea salt water, maifan stone, which is composed of silicate minerals and multiple micro-nutrients, tourmaline mineral ore and titanium mineral ore.

### *Statistical analysis*

The dynamics of the symptoms was quantitatively analyzed and visualized using the Wolfram mathematica software.

## RESULTS

The dynamics of the ARVI symptoms was investigated for each patient during the 5 days of treatment with conventional medication. At the beginning of the study, each patient from each group had almost all symptoms (Table 1). 100% of the patients exhibited fever, cough, and mucosal hyperemia. Sore throat was the least pronounced symptom, varying from 67% to 83% across the groups.

**Table 1: Symptoms of ARVI in four groups of patients before the treatment.**

Symptom	N (%)			
	Group 1	Group 2	Group 3	Group 4
<b>Fever</b>	6 (100)	6 (100)	6 (100)	6 (100)
<b>Headache</b>	5 (83)	6 (100)	6 (100)	6 (100)
<b>Cough</b>	6 (100)	6 (100)	6 (100)	6 (100)
<b>General weakness</b>	6 (100)	5 (83)	5 (83)	6 (100)
<b>Nasal congestion</b>	5 (83)	6 (100)	5 (83)	5 (83)
<b>Rheum</b>	5 (83)	5 (83)	5 (83)	5 (83)
<b>Sore throat</b>	4 (67)	5 (83)	4 (67)	5 (83)
<b>Mucosal hyperemia</b>	6 (100)	6 (100)	6 (100)	6 (100)

After 5 days of the treatment, during which the patients were prescribed to sleep either on the BVSM or on regular mattresses in rest hours, the overall state of all patients was improved. The number of patients with the ARVI symptoms decreased in each group and for each symptom (Table 2). However, the recovery rate was not uniform but dependent on the group. Patients in groups 1 and 2 were treated in the background of sleeping on the BVSM, while patients in groups 3 and 4 were treated sleeping on regular mattresses. Figure 1 shows that each symptom was vanishing faster in the joint 1st and 2nd

groups as compared to the joint 3rd and 4th groups. Therefore, groups 1 and 2 demonstrate a better recovery of the patients with ARVI in comparison with groups 3 and 4, indicating the positive influence of the BVSM. The largest difference in the recovery rates between the '1+2' and '3+4' groups is shown by nasal congestion (33% difference), cough (25%), and rheum (25%). In addition to the quantified disease symptoms, all patients used BVSM and only half of patients used regular mattresses reported relief of breathing, thus confirming the BVSM efficacy.

**Table 2: Symptoms of ARVI in four groups of patients after 5 days of treatment.**

Symptom	N (%)			
	Group 1	Group 2	Group 3	Group 4
<b>Fever</b>	1 (17)	1 (17)	2 (33)	2 (33)
<b>Headache</b>	0 (0)	1 (17)	2 (33)	1 (17)
<b>Cough</b>	1 (17)	2 (33)	3 (50)	3 (50)
<b>General weakness</b>	3 (50)	4 (67)	4 (67)	4 (67)
<b>Nasal congestion</b>	1 (17)	1 (17)	3 (50)	2 (33)
<b>Rheum</b>	1 (17)	2 (33)	3 (50)	3 (50)
<b>Sore throat</b>	2 (33)	2 (33)	3 (50)	3 (50)
<b>Mucosal hyperemia</b>	2 (33)	1 (17)	3 (50)	2 (33)

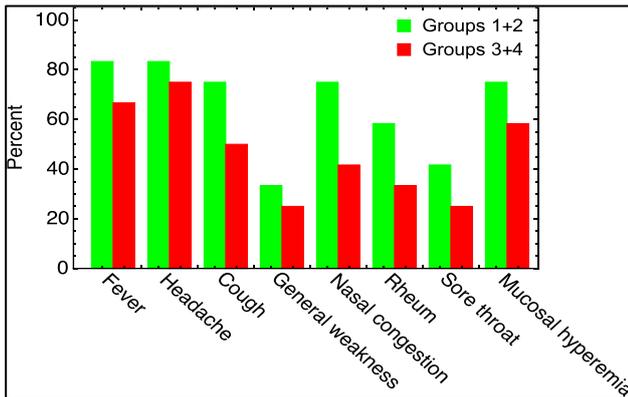
In order to take into account a possible influence of the a priori knowledge (either true or false) of the patients about the mattresses that they used during the study, we analyzed the recovery rate by each symptom for each group separately (Figure 2). The results show that, for each symptom, the recovery rate of patients from group 1 (BVSM used, patients truly informed) is higher than from group 3 (regular mattress used, patients truly informed). This fact reflects the positive influence of the BVSM on the ARVI dynamics under uniform conditions of true a priori knowledge.

Moreover, the recovery rate of patients from group 2 (BVSM used, patients misinformed) is higher than from

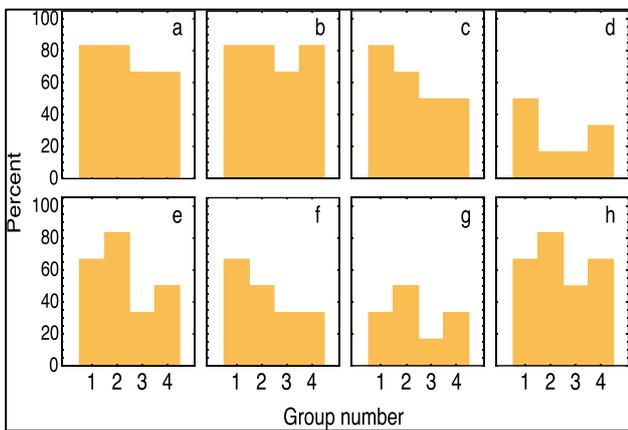
group 4 (regular mattress used, patients misinformed) for most symptoms. The exceptions are headache (Figure 2b; equal rates) and general weakness (Figure 2d). This comparison test is stricter, since the patients from group 4 tend to be influenced by placebo, while the patients from group 2 are under the influence of the opposite effect, with the possible diminishing of truly positive BVSM influence due to misinformation that they used regular mattresses. Therefore, the solid difference between the recovery rates in groups 2 and 4 demonstrates that the placebo effect is insignificant.

The recovery rate for group 2 (BVSM used, patients misinformed) is higher than for group 3 (regular mattress

used, patients truly informed) (Figure 2), with the exception that the rates are equal for general weakness (Figure 2d). The recovery rate for group 2 is also higher or equal to the rate for group 1 (BVSM used, patients truly informed) for most symptoms, except for cough (Figure 2c), general weakness (Figure 2d), and rheum (Figure 2f). These results further exemplify that the positive effect of BVSM on the disease treatment dynamics was essentially independent on the a priori knowledge of the patients about the fact that they used these mattresses.



**Figure 1: Difference between the number of patients with a given symptom before and after the treatment. The difference was calculated for the set of patients from groups 1 and 2 ('group 1+2', green) and from groups 3 and 4 ('group 3+4', red), shown in percent of the total number of patients in each set.**



**Figure 2: Difference between the number of patients with a given symptom before and after the treatment, shown for each group separately. The order of symptoms is as follows: a) fever, b) headache, c) cough, d) general weakness, e) nasal congestion, f) rheum, g) sore throat, and h) mucosal hyperemia.**

## DISCUSSION

In the current period of the worldwide pandemic of the SARS-CoV-2 coronavirus, more interest is attracted to the protection methods against respiratory virus

infections, including ARVIs.<sup>9-11</sup> As there are no approved vaccines or medicine for these diseases, alternative approaches are promising as a complement to the molecular studies.<sup>5</sup> One possible strategy for such approaches consists in improving the quality of the daily life conditions of a patient with ARVI during treatment by conventional medication, thus promoting a better background in which the organism could struggle with the infection more effectively. We investigated the applicability of this approach in the case of improving the sleep quality of patients with ARVI by the BVSM. Our results demonstrate a great potential of the BVSM as a complementary tool for increasing the recovery rate during treatment.

The positive influence by the BVSM is reflected in the higher recovery rates exhibited by the patients with ARVI which were treated in the background of sleeping on these mattresses, as compared to the patients who were sleeping on regular mattresses during treatment. Two factors make the conclusion about this influence robust. Firstly, multiple symptoms were used to characterize the ARVI state of patients. The dynamics of these symptoms provide a robust estimate of the disease dynamics. The patients used the BVSM demonstrated higher recovery rate by all symptoms. The most pronounced influence by the BVSM was observed for nasal congestion, cough, and rheum.

Secondly, the placebo effect and, more specifically, the influence of the a priori information about the experiment details on the disease dynamics were thoroughly controlled by splitting patients into four groups in the double-blind experiment setup. The a priori information showed only a weak influence on the recovery rate, thus increasing the confidence of the obtained results.

The study showed good results, but they should be considered as rather preliminary as we used a relatively small number of patients per group. It is desirable to increase the number of patients up to hundreds in order to increase significance level. We believe this study will motivate such extended experiments both with the BVSM and other complementary tools for treating the ARVI.

## CONCLUSION

Overall, we may conclude that the continuous usage of the BVSM leads to a better recovery from the ARVI during the treatment with conventional medication. These mattresses can be considered as an effective tool for increasing the quality of sleep and alleviating the disease state in patients.

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