THERMOMETRY: BETWEEN EFFICIENCY AND INEFFICIENCY IN THE EPIDEMIOLOGICAL TRIAGE, IN THE PREVENTION OF COVID-19 IN PRESCHOOL AND STUDENTS

Lia Vlaicu, Mirela Simona Coporan,
School medical office, Timișoara

Abstract

At the beginning of the SARS-CoV-2 pandemic, when there was very little data regarding the virus' properties and the illness' symptoms, thermometry was considered the first method of identifying a person suspected of being infected with the new coronavirus, due to the fact that fever was considered to be the most characteristic and frequent symptom of the infection.

Also, the occurrence of a large number of infection cases in a short period of time required a rapid identification of people at risk of transmitting the infection, so the introduction of temperature scanning allows rapid and reliable, but especially non-intrusive, identification of people with high body surface temperature and the possibility of isolation of these individuals for more accurate testing.

In time, however, it was found that approx. 80% of those infected are asymptomatic, which is why the importance of thermal scanning has been reconsidered.

Keywords: fever, temperature scanning, SARS-Cov-2, covid-19, asymptomatic

In the clinical picture of the patient infected with SARS-CoV-2, fever is one of the most common symptoms, initially considered by the WHO, in April 2020, to occur in adults in approx. 90% to 98% of positive cases, which is why thermal scanning was considered an effective method of prevention in epidemiological triage.

In the definition of patients with severe acute respiratory infection (SARI) suspected of having SARS-CoV-2 infection, the WHO provides the following:

- acute respiratory infection with fever or history of fever ≥38 C° and cough
- symptoms appeared in the previous 10 days;
- requires hospital admission.

However, the absence of fever DOES NOT exclude a viral infection [1].

The WHO warns that thermometers cannot detect infected persons if they do not yet have fever. Usually it takes from 2 to 10 days for an infected person to have symptoms, including fever, during which time they are contagious [1].

In Romania, thermometry was regulated by Government Decision no. 24/2020 and subsequently by Joint Order of the Ministry of Interior and the Ministry of Health: it provides that at the entrance in public institutions and other enclosed spaces temperature must be measured with a non-contact thermometer, and if the result is greater than 37,3^{O}C during three consecutive measurements that person is denied access to that public space.

The public institutions have as obligations:

• ensuring epidemiological triage - consisting in controlling the temperature of own staff and visitors, with a non-contact thermometer, at the control/ access points in the premises;

• not to allow entrance on their premises to persons whose temperatures, measured at entrance check points, are greater than 37,3ºC [2];

* C**orresponding author**: Lia Vlaicu, medic Dispensar școlar Timișoara, e-mail: liavlaicu@yahoo.com
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• during the state of alert, the obligation of public institutions and authorities, economic operators and professionals to organize the activity so as to ensure the obligatory disinfection of hands at the entrance, under the conditions and in compliance with the general instructions on hygiene measures;

• if the measured temperature is greater than 37,3º C a new temperature measurement is recommended after 2-5 minutes;

• if the temperature, at the second measurement, is still above 37,3ºC or/and the person has respiratory symptoms, entry on the institution's premises will not be allowed and the person will be recommended to get in touch with his/her physician for a specialty examination;

• if the measured temperature does not exceed 37,3ºC, and the person has no respiratory symptoms, access will be permitted but only accompanied by a staff member and only after recording in the registry the room/office/department that will be visited;

• monitoring respiratory symptoms (such as frequent cough, frequent sneezing, altered general condition) ;

• Epidemiological triage does not involve the registration of personal data [3].

In May 2020, a joint US-German study showed that fever in positive patients occurred on average 6 days after infection and in 97.5% of cases was identified within 13 days of exposure [4].

At the same time, the US Centers for Disease Control and Prevention (CDC) points out that the virus can be transmitted by asymptomatic people or people with very mild symptoms, representing a considerable proportion of those infected, noting that temperature scanning is not the best method for preventing the pandemic, the most effective measure remaining social distancing [5].

In the meantime, several studies on thermal scanning are published:

• a study conducted in New York on a sample of 5,700 patients with COVID-19 showed that only 30% of them had fever, so that the spread of the disease cannot be stopped by simple thermal scanning [6];

• a mathematical model developed by the London School of Hygiene and Tropical Medicine (LSHTM) shows that thermal scanning at the airport could detect less than one in five passengers infected with COVID 19. The model is based on the idea that COVID-19 symptoms appear in about 5 days after the infection with the new coronavirus [7];

A recent paper published in the New England Journal of Medicine shows that most people are infected with the new coronavirus for just over five days before showing symptoms. Using this information, combined with thermal scanner sensitivity data, the LSHTM team used a mathematical model to estimate that for every 100 infected passengers intending to take a 12-hour flight, only 9 will be detected on airport screening. [7].

The model also estimates that 49 passengers would be detected by pre-boarding screening, but 42 infected passengers will pass both entry and exit checkpoints, undetected. The exact numbers depend on how good the screening is in detecting symptoms, as well as the time periods between infection and disease.

Billy Quilty, a research assistant and PhD student at LSHTM and a member of the modeling team, said screening for incoming flights from affected areas appears to be a rational measure to prevent the import of coronavirus cases. However, screening is only able to detect infected travelers who show symptoms, such as fever [7].

According to The Wall Street Journal, medical experts state that fever is not a good indicator for SARS-CoV-2 infection, baseline temperature varying with age, sex and other factors [8].

Studies have shown that body temperature has a circadian rhythm, varying throughout the day, depending on the circadian rhythm of that person [9].

Researchers such as Philip Mackowiak, professor emeritus at the University of Maryland School of Medicine, show that the temperature of adults varies on average by one degree or more over the course of a day, and published a study in this regard in the journal JAMA [10].

Mackowiak's study shows that in most people the oral temperature reaches a peak of 37.7 C in the evening. The same doctor points out that non-contact thermometers usually kept near the forehead are problematic because they are not standardized, and the results of their scanning can be affected by sweat, makeup and even the time of day, and Dr. Beers shows that the accuracy of thermometers decreases with their use in time and that thermometers have

a different lifespan, so their accuracy must be constantly checked [8].

Another argument is that a temperature> 37.3º C also occurs in other infectious or non-infectious diseases, not being a specific symptom of SARS-CoV-2 infection, so for these patients it is not necessary to apply the protocol to prevent the spread of COVID-19.

Although infections are the most important cause of fever, a differential diagnosis in any fever in children is a mandatory step and a basic intellectual and clinical exercise.

The etiological classification of fever includes:

• Infections (bacterial and viral) - the most common cause in children

• Neoplasm

• Systemic diseases - autoimmune [11].

A study conducted by CDC on 300 children with COVID-19 found that only 56% of them had fever, which is why currently in the context of reopening schools CDC does not recommend thermal scanning as a means of detecting symptoms for COVID-19 and implicitly infected people [12].

Likewise, the provisional recommendation of the American Academy of Pediatrics regarding the reopening of schools is not to make universal temperature checks [12].

In Romania, the first major epidemiological screening test by thermal scanning took place on June 15 2020, when the first test of the National Assessment Examination was organized.

According to official data, the temperature of 161,038 students who attended the national exams was measured, of which only one student had a temperature > 37.3º C and he was not suspected of COVID-19, he had a cannula in his arm as he was having intravenous treatment for enterocolitis.

Other studies were conducted during the pandemic and CDC highlighted new symptoms that are frequent with the new coronavirus infection: loss of taste and loss of smell.

In June 2020, after analyzing the pattern of the pediatric cases, CDC concludes that the gastro-intestinal symptoms are more frequent in children (66%) that in adults (6%) [13].

A study conducted by the Chinese specialists in the Hubei province showed that 50% of the infected persons had digestive symptoms such as nausea, vomiting and stomach aches, without having respiratory symptoms [14].

The case definitions for the acute respiratory syndrome with the new coronavirus (COVID-19) were updated by the National Center for Surveillance and Control of Communicable Diseases on 19.06.2020 as follows: - for children up to 16 years of age who have gastrointestinal manifestations (vomiting, diarrhea) not associated with food, a SARS-CoV-2 infection may be suspected [15].

It is extremely important in assessing the evolution of the disease to know that the virus is transmitted orally-orally and fecally-orally; it persists in stool for 22 days, in serum for 16 days and in the respiratory tract for 18 days. The viral load in the faeces is directly proportional to the severity of the disease and can be used in assessing the evolution of the disease and / or as a prognostic factor [14].

Dr. Tom Waterfield, researcher at Queen's University in Belfast, says: "If we want to actually diagnose infection in children, we need to start looking at diarrhea and vomiting, not just at respiratory tract symptoms." [16]

The re-evaluation of this new data led to warnings from specialists and to recommendations for measuring the temperature with oral thermometers, being considered as the most accurate ones, and for their use even at home.

In practice, it has been found that some parents measure their children's temperature so often that doctors say they diagnose more cases of recurrent fever syndromes than usual, these being auto-inflammatory disorders in which children have recurrent episodes of fever and other symptoms [17].

In other cases, doctors were surprised by parents who say that their otherwise healthy children had low temperatures for weeks, not being clear whether or not this is related to a case of undiagnosed asymptomatic COVID-19 [17].

In Romania, the joint MS and MEC Order no. 5487/1494/2020 was published in August 2020 in the Official Gazette, and provides for the daily triage by the parent at home by measuring the body temperature and assessing the child's health status after which the parent decides whether to take the preschooler / student to kindergarten / school or not. Those with a temperature > 37.3º C and / or symptoms specific to

SARS-CoV-2 infection (cough, breathing difficulties, shortness of breath, diarrhea, vomiting) or symptoms of other infectious-contagious diseases will not attend classes on that day [18].

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