

# Use of handheld infrared thermometers in COVID-19 pandemic for mass screening: Understanding its implications through a case report

Dear Editor,

There has been a growing concern regarding the use of handheld infrared thermometers (HITs) for mass screening in COVID-19. Recent articles have rightly pointed out the flaws in their use for screening of individuals at public places such as commercial buildings, hospitals and airports in the absence of concrete evidence to support its use.<sup>[1]</sup>

We hereby report a case of malfunctioning of a HIT. It was being used by the security guards at the entrance of a residential complex in Bhopal, Madhya Pradesh located in central India. Highly fluctuating temperatures, with a few exceeding 104°F, were recorded for seven visitors using it; all of them were apparently well with no symptoms whatsoever. A digital thermometer was used to check their axillary temperatures multiple times, with proper sanitization in between the measurements using hand sanitizers having 70% alcohol, and all of their readings were found to be in the normal range (97.9–98.4°F). The HIT had been recently purchased through an e-retailer and the defect got noted right after its initial use. It was discarded and was no longer used for screening.

There is a great deal of ambiguity regarding the fever threshold temperature for HIT. While one study proposed that it should be 35.6°C (96.08°F),<sup>[2]</sup> a more recently published article considers 36°C (96.8°F) as the cut-off temperature.<sup>[3]</sup> Larger multicentric studies are needed to get an accurate value. In addition to this, similar to tympanic temperature, the normal forehead temperature range might be different in neonate, children and adults. Hence, we need to be cautious in extrapolating the results to different age populations. Further, offset of each individual HIT should be noted before putting them into use. In our case, since a single observer was involved; the inaccurate readings were not likely due to observer error. Otherwise, chances of such errors and biases encroaching are quite high and should be accounted for while interpreting the results.

Although the HITs are being used for mass screening at public places such as the airports and shopping malls, there is very little evidence to support its use. In fact, similar to our case, several studies have pointed towards HITs being less accurate than the tympanic thermometer and other infrared thermographic systems for fever detection.<sup>[4,5]</sup>

One important prerequisite to using HITs is that the operator should be properly trained since the accuracy of the values depend on the subject-thermometer distance and the angle at which it is aimed at the forehead, mainly because of physiological differences, and consequently, unequal heat distribution at different segments of the forehead. Other individual factors such as hot beverage consumption, pregnancy and menstruation might be associated with a raised forehead temperature.<sup>[6]</sup> Intense perspiration and air-conditioning can decrease the cutaneous temperature on the other hand. Although the inner eye corners and the external auricular areas are better sites for recording the surface temperature, they are not as accessible as forehead. Further, the person should remain immobile in front of the HIT for a few seconds for accurate results. All of these raise questions on the reliability of HITs as tools for fever screening.

Based on the high specificity (75.4–99.6%) and negative predictive (86.1–99.7%) values, it might be argued that HITs are suitable for mass screening.<sup>[6]</sup> However, the reported sensitivity values are highly discouraging since it indicates that the risk of missing febrile persons (1-sensitivity) would be around 85%.<sup>[7]</sup> Further, given that the positive predictive value is quite low (0.9–76%),<sup>[6]</sup> a high proportion of the individuals, mistakenly classified as febrile and subsequently advised for COVID-19 testing and medical management, might be aroused, generating hostile reactions. Although it imparts a reassuring effect psychologically, confidence of the public on HITs might soon be lost due to its low sensitivity, allowing undetected COVID-19 positive individuals to especially enter the country via the airports, causing secondary cases.

There are certain nuances associated with mass fever screening in general. Patients could take antipyretics and hide facts about their recent whereabouts, making the entire process highly futile. Further, even infected individuals might not have raised temperature or other symptoms in their incubation period of 2–14 days. However, it might not be a total waste since the simple knowledge that the screening is in place might dissuade infected and exposed individuals from visiting public places.

We reported our case to the local Medical Device Adverse Event Monitoring Centre which is one of the many centres to be established under the Materiovigilance program of India<sup>[8]</sup> that started in 2015 for postmarketing surveillance of medical devices in the country.

HITs are commonly used for preventive maintenance of industrial equipment to ensure safety and reliability. Malfunctions in machine parts such as switchgears, fuses, motor or electrical connections associated with raised temperatures are easily pointed out by these handheld pyrometers. Similarly, periodic quality assurance tests<sup>[9]</sup> and preventive maintenance activities should be undertaken for the HITs. Cross-checks by tallying the HIT readings with that of a validated digital thermometer, accompanied by a receiver operator characteristic curve, would give us a sense of the sensitivity and specificity of the instrument. In the event of these being highly deranged, the HIT under question should be discarded and reported to the competent authorities.

Temperature screening may not be a fool proof method, especially after set-in of community transmission of an epidemic or a pandemic and for asymptomatic carrier stage of an infectious disease. However, its utility as a method of fever screening for the purpose of triaging, particularly in places of human aggregation, remains vital. The debate on using forehead HITs is a longstanding one with studies criticizing their role as medical device because of the fixed offset.<sup>[10]</sup> Our case report is an addition to the growing evidences, suggesting that the usage of HITs for fever screening in COVID-19 should be critically reviewed and better alternatives should be sought for.

### Ethical statement

No patient specific data has been described and hence no ethical issue arises.

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### Conflicts of interest

There is no conflict of interest.

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