



A Comparative Study of Accuracy of Non-contact Infrared Thermometry and Axillary Digital Thermometry in Children

KEYWORDS

Non-contact infrared thermometry, digital thermometry, children.

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ABSTRACT Accurate temperature measurement remains a key element for any health care services.

Axillary digital thermometry is a well accepted method everywhere.

Objective: To compare the results of two methods of temperature measurements by non contact infrared thermometers and digital thermometers in children and determine the agreement between the two methods.

Design: Prospective comparative study

Duration: 1st May to 15th May 2014.

Setting: Pediatric ward of a tertiary care teaching hospital at Smt. SCLGH, Ahmedabad.

Method: Body temperature of children admitted in pediatric ward was measured by both digital and non contact infrared thermometers.

Result: Statistical analysis by Bland Altman plot suggests that the two methods do not agree.

Conclusion: infrared thermometers need some improvement in technology to become accurate for temperature measurement.

Introduction

One of the commonest presenting complaint in pediatric patients is fever. Temperature is one of the vital parameters used by a clinician in a health care setting. Accurate temperature recording is essential for documentation of fever pattern and it acts as a useful aid in reaching the diagnosis. Medical decisions related to diagnosis and planning of investigations or pharmacological interventions are driven by body temperature measurement.

Technological advances have led to the development of thermometers for measuring body temperature faster with fewer health risks. The conventional mercury thermometer is rapidly being replaced by digital thermometers. Measurement of body temperatures should be rapid, accurate, valid and reliable especially in children as fever in children is often associated with complications like seizures, dehydration and others.

The routinely used Axillary thermometer is somewhat time consuming and difficult in uncooperative children. As compared to this the non contact infrared thermometer can be used rapidly and non invasively to detect the temperature and thus causes less distress to patients.

Traditionally in the health care, infrared thermometers have been used as a screening tool at airports to measure temperatures of incoming passengers from affected nations.

The aim of this study is to conclude whether infrared thermometers are accurate enough to be used in pediatric set up for body temperature measurement.

Objective:

To compare the results of two methods of temperature measurements, by non-contact infrared thermometer and digital thermometer, in children and determine the agreement between two methods.

Method:

A prospective comparative study was carried out in the paediatric ward of a tertiary care teaching hospital. To reduce ambiguity of the results, temperature was taken in a secluded corner of the paediatric ward to minimise exposure to external environmental factors. Axillary temperature was taken after wiping underarm with dry towel and digital thermometer probe tip was placed under the arm so the tip remained in contact with skin and temperature recording was recorded after the beep sound from the digital thermometer. Forehead temperature was taken with infrared thermometer at approximately 0.5-1 cm distance from the forehead at glabella. Time taken for temperature measurement being 3 seconds.

Digital thermometer used in study was TB 100 ROSSMAX and infrared thermometer was THERMOFINDER FS 300. All temperature recordings were taken by trained nursing staff and doctors.

A single reading from each method was recorded in 20 children for 5 days. The temperature recording was done in °F. To study the statistical agreement between two methods, newer method of comparison- Bland and Altman plot method was applied. A mean difference of less than 1°F was considered clinically acceptable. The study was conducted from 1st May 2014 to 15th May 2014.

Results:

All the collected data were statistically analysed. Temperature measurement by axillary digital thermometer and noncontact infrared thermometer do not agree well (mean difference =-1.5, 95% limits of agreement: [-2.7,-0.3]) by Bland and Altman⁽¹⁾ method. Infrared thermometer readings are not correlated with digital thermometer. So infrared thermometer used to replace digital thermometer for children temperature measurement gave unsatisfactory result.

Table 1 : Comparison of results :

	Range	Mean	Mean Difference
Digital Thermometer	97.4-104.1	100.023	-1.501
Infrared thermometer	98.8-105.6	101.524	+1.501

Discussion:

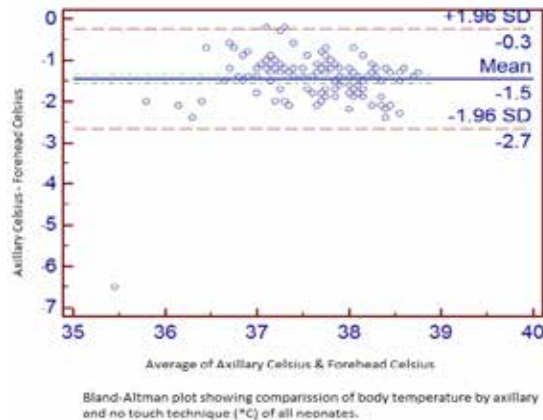


Table 1: Bland-Altman plot showing comparison of body temperature by Axillary and no touch technique of all children

After introduction of infrared thermometer various studies were done to compare the infrared thermometer result with other method for temperature measurement. Infrared thermometer was reported to be simple, non-invasive, and rapid. Chiappini , et al. reported a good agreement (mean difference= 0.07°C , 95% limits of agreement:[-0.06,0.76]) between infrared forehead thermometry and axillary thermometry using glass thermometer in paediatric population.⁽²⁾ In contrast Fortuna, et al. compared IRFT to rectal thermometry in 200 children aged 1 month to 4 year with a mean age of 1.4 y and reported a broader 95% prediction band (on the order of 4°F) which is clinically not useful.⁽³⁾ A similar study conducted by Sethi et al, did not show agreement between the axillary and forehead method (mean difference -0.5°C, 95% limit of agreement [-2.3,1.2],⁽⁴⁾ while Seher et al, reported similar result with slightly narrower band for 95% confidence limits (mean difference=0.2°C, 95% limits of agreement [-1.2,1.6] in adult population.⁽⁵⁾ In current study we found higher mean difference and slightly lower narrower band well (mean difference = -1.5, 95% limits of agreement: [-2.7,-0.3].

Conclusion:

Non- contact infrared thermometry is a newer technique of temperature measurement that is simple, rapid and easy as compared to other traditional methods. Temperature readings however are affected by the various factors like warmers, nearby wall of room temperature, etc. So the results achieved were not satisfactory. It needs some improvement in technology to become accurate for temperature measurement for a routine use in paediatric age group.

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