

## Comparison of tympanic temperature readings with axillary thermometer in the OPD setting

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### Objective

To compare and correlate the Tympanic Temperature (TT) readings with the Axillary Mercury Thermometer (AMT) in the OPD setting.

### Subjects and Methods

The study was carried out in the outpatient departments (OPD) of Pediatrics, ENT and Surgery, Shifa International Hospital, Islamabad from June 1, 2008 to October 31, 2008. A total of 400 pediatric patients were included in the study. Both tympanic membrane and Axillary temperatures were recorded in each patient. They were grouped into males and females and their ages ranged from 0.1 years to 15.0 years (mean

5.347±4.208 years). Taking Axillary temperatures as standard, tympanic temperature (TT) recordings were analyzed and compared. An intra-class Pearson correlation coefficient (r) was calculated for closeness of correlation of TT with axillary temperature.

### Results

Mean temperature reading from the AMT was 98.046±1.3840 F while the mean TT reading was 97.867oF±1.5519.0 Overall Correlation between AMT and TT readings was 0.925 (?<0.00). (Rawal Med J 2009;34:216-218).

### Keywords

Temperature, tympanic membrane, axilla.

## INTRODUCTION

Temperature recording is an essential and integral part of assessment in a sick child, whether that child is being evaluated in the OPD or he/she is hospitalized. Association of body temperature with the severity of illness is well established. Low temperature in a neonate is as alarming as high temperature in a 2 year old child. This is the reason that whenever a sick child is being evaluated the temperature recording should be accurate, at the same time it should be fast and less threatening to the child. Correlation of that temperature with the methods of temperature recording varies depending upon the working environment and availability of the resources. A good temperature recording instrument should be accurate, acceptable to the patient, hygienic and quick. Recording with infrared ear thermometer comes close to this. A digital thermoscan device can record body temperature from the tympanic membrane. Since taking TT is easy quick and less traumatic to children. Multiple studies have been done on this subject around the world. Some studies have found good correlation between TT and core body temperature as recorded by other means.<sup>1</sup> while other studies did not find good correlation between temperatures recorded by TT and by other means.<sup>2,4</sup> It has also been

recommended in the ICU settings as an alternative to invasive temperature monitoring. We wanted to see the correlation and accuracy of Tympanic Temperature (TT) readings with the Axillary Mercury Thermometer (AMT) in the OPD setting.

## SUBJECTS AND METHODS

A Comparative Validation Study was conducted in the OPD of Pediatrics, ENT and Surgery at Shifa International Hospital, Islamabad (a tertiary care teaching institute affiliated with Shifa College of Medicine) from June 1, 2008 to October 31, 2008. A consecutive sample of 400 patients, ranging from 0.1 to 15.0 years of ages, of both genders, presenting to these three departments were included with their consent. Children with perforated ear discharge and otalgia (tympanic temperature recording not feasible) and patients not willing for these methods and those with otitis media, intracranial tumors, or treated with immunosuppressive medication were excluded from the study.<sup>5</sup>

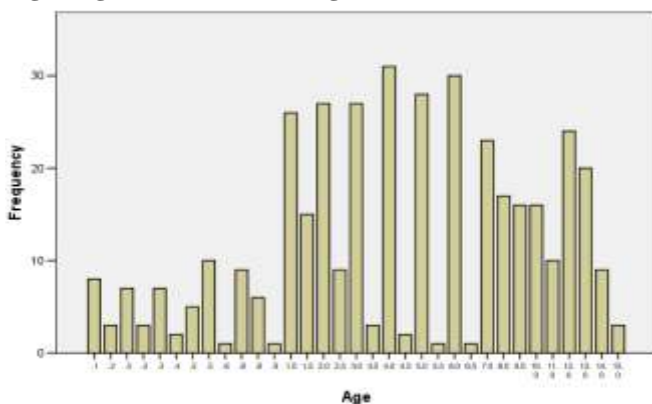
Two nurses, who were trained by the principal investigator, collected the data, on indexed charts, by taking a single TT reading from the right ear followed by an AMT reading. A Beurer® FT25 thermometer was used for tympanic temperature readings and a glass mercury thermometer was used

for taking axillary temperature. Data was statistically analyzed in SPSS version 13. Axillary and tympanic temperatures were calculated as means±SD. The main outcome variables to be considered were the correlation between the two readings across the wide temperature range.

**RESULTS**

A total of 400 patients, comprising 217(54.3%) males and 183(45.7%) females were included in the study. The age distribution in the sampled patient population ranged from a minimum of 0.1 years to a maximum of 15 years (Fig.1), with a mean age of 5.347 years (SD±4.2084).

**Fig. 1. Age Distribution Histogram.**



The mean overall temperature reading from the AMT was 98.046oF (SD±1.5834) while the mean TT reading was 97.867oF (SD±1.5519). Axillary and Tympanic Temperature Pearson Correlation was found to be 0.925 (Good Correlation) p<0.000 (Table 1).

**Table 1. Axillary and Tympanic Temperature Pearson**

		Axillary	Tympanic
Axillary	Pearson Correlation	1	.925(**)
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	1000.294	907.323
	Covariance	2.507	2.274
Tympanic	Pearson Correlation	.925(**)	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	907.323	960.961
	Covariance	2.274	2.408

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Correlation.**

T-Test and Paired Differences are shown in Table 2 & 3.

	Mean	N	Std. Deviation	Std. Error Mean
Axillary	98.046	400	1.5834	.0792
Tympanic	97.867	400	1.5519	.0776
		N	Correlation	Sig.
Axillary & Tympanic		400	.925	.000

**Table 2. Axillary and Tympanic Temperature T-Test.**

The graphic bivariate correlation of axillary and tympanic temperature readings is illustrated in (Fig. 2), indicating closely related AMT and TT readings.

	Paired Differences				t		df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Axillary - Tympanic	.1788	.6062	.0303	.1192	.2383	5.898	399	.000

**Table 3. Axillary and Tympanic Temperature Paired Differences.**

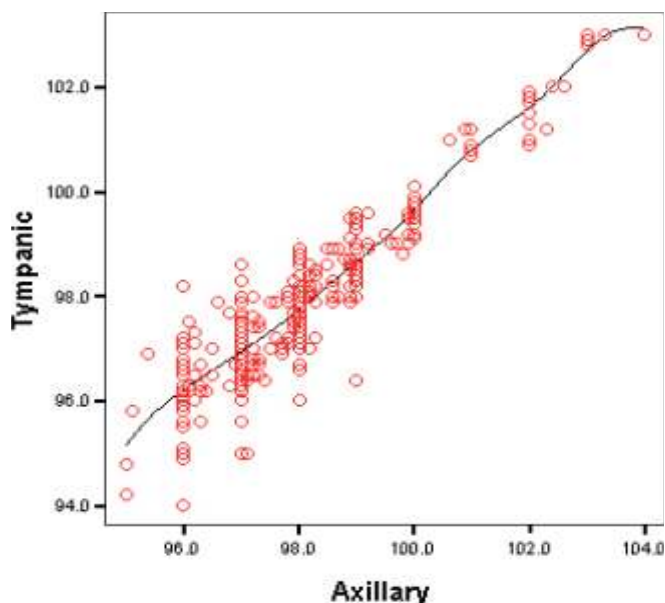
**DISCUSSION**

Temperature recording should be accurate, quick and least threatening to the child. Core temperature recording through pulmonary catheter is considered gold standard in critical care setting,<sup>6</sup> however this is not practical in OPD patients. In pediatric patients rectal temperature taken with a glass mercury thermometer represents the core body temperature. This method is not always feasible.

There are divergent views in the literature about reliability of thermoscan in detecting febrile patients. Most of these studies have focused on pediatric age groups or critical care settings. No published data is available in the national literature. Axillary temperature recording requires keeping the thermometer in the axilla for at least two to three minutes, the thermoscan can detect the near-core temperature in 2 seconds. Therefore it has a potential to save considerable time in the busy clinic settings as seen in most of the public sector institutions.

As Thermoscan is quick method of temperature

recording and less cumbersome for the child and the healthcare worker, we wanted to evaluate the suitability and reliability to use this device in our outpatient care settings in children. Even the children who have had minor ear surgery it was found to be reliable.<sup>7,8</sup> Studies have found TT to be lower than the core temperature.<sup>9</sup> We also noticed similar findings in our study. Its use in emergency department has also been recommended.<sup>1,10</sup> In another study TT readings were found to be reproducible,<sup>11</sup> and accurate in febrile children.<sup>10</sup>



**Fig 2. Axillary and Tympanic Temperature Graphic Correlation.**

**CONCLUSION**

Tympanic temperature recording is a quick, accurate, less traumatic and reliable method for recording temperature in children. Its efficacy and

reliability can specially be helpful in busy OPD settings.

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