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Southeast Asian Journal of Health Professional

Journal homepage: https://www.sajhp.com/

Original Research Article

A comparative study to assess the reliability of the digital and glass thermometer in the adults admitted in all male wards of Era medical college & hospital Lucknow, U.P.

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ARTICLE INFO

Article history:
Received 25-08-2022
Accepted 01-09-2022
Available online 20-10-2022

Keywords:
Vital signs
Reliability
Thermometer

ABSTRACT

Background: Temperature is one of the most common and important clinical sign. Maintenance and monitoring of the thermoregulation is a basic requirement in nursing care. Determining accurate measurement of temperature is very important for providing quality care to the patient and to prevent complication as abnormal temperature is strongly associated with the serious diseases.
Introduction: Vital signs are basic component & assessment of physiological & psychological health of the client. Vital signs (Cardinal Signs) and its component body temperature, pulse, respiration, blood pressure & pain. Body temperature is an indicator of health & its is important vital sign. Body temperature regulated by thermo-regulating center in Brain called as Hypothalamus. Body temperature measure by various types of thermometer available in the market.
Aim: The aim of the study to assess the reliability of the digital & glass thermometer.
Research Design: The design selected for present study was comparative research design.
Sample Size: The study was conducted on 60 male patients who was selective by using convenient sample technique.
Results: The results revealed that there was no significance difference between digital & glass thermometer at (PC0.05) level of significance tabulated 2 value (0.97) and clinical significance 0.2° celsius.

1. Introduction

Body temperature is a measure of the body's ability to generate and get rid of heat. The normal physiology is to keep body temperature within a narrow safe range in spite of large variations in environmental temperatures. Maintenance of temperature occurs through the integration of multiple body systems that interact to maintain a balance between heat loss and generation. Normal body temperatureibody temperature occurs in early morning hours and the highest temperature occurs in the late afternoon. Body temperature also increases as a result of overdressing or strenuous exercise especially in hotweather. [1]

Vital signs are basic component of assessment of physiological and psychological health of a client. Other term used for vital signs is cardinal signs and its components are Body temperature, pulse, respiration and blood pressure. The first component of vital signs is Temperature, which is defined as the degree of heat which is maintained by the body. It is the balance between heat produced and heat loss from the body. Body temperature is an indicator of health and disease and one of the vital signs. Body temperature varies with the time and site of measurement. It is regulated by thermoregulatory centre in the hypothalamus that balance heat production and heat loss. The regulation

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https://doi.org/10.18231/j.sajhp.2022.016

of the body temperature is maintained by two mechanisms thermo-genesis and thermolysis.

Thermo-genesis is the production of heat by chemical regulation. Many factors that produce heat in the body are oxidation of food, specific dynamic action of food, exercise, strong emotions, hormonal effect, change in the environmental and atmospheric conditions and disease conditions. Thermolysis is the loss of heat by physical regulation. Heat loss from the body by various methods like - conduction, convection, radiation, evaporation.[2] There are mainly two types of temperature:

1. **Core temperature:** Core temperature is the temperature of deep tissue of the body like cranium, thorax, abdominal and pelvic cavity.
2. **Surface temperature:** Surface temperature is the temperature of skin, subcutaneous tissue and fat. It can vary according to environment temperature.

Table 1: Sites for taking temperature and their normal values

Sites For Taking Temperature	Normal Value
Oral	98.6 °F
Rectal	99.6 °F
Axillary	97.6 °F

Fever or pyrexia is defined as a rise in the body temperature above 99.6°F depending on the characteristics fever is further divided into- Intermittent ever The Body temperature alternates regularly between a period of fever and period of normal or subnormal temperature.

1. Remittent fever- The body temperature fluctuates several degree, more than two degree centigrade, above normal but does not reach normal between fluctuations.
2. Constant fever- The body temperature remains consistently elevated and fluctuates little less than two degree centigrade..
3. Relapsing fever- The body temperature returns to normal for at least a day, but than fever occurs again.
4. Resolution of pyrexia by crisis - An elevated body temperature returns to normal suddenly.
5. Resolution of pyrexia by lysis - An elevated body temperature returns to normal gradually.

Depending on the range of body temperature fever is divided into

1. Hypothermia - Below 95°F
2. Subnormal temperature - 95-98°F
3. Low pyrexia - 99-100°F
4. Moderate pyrexia 100-103°F
5. High pyrexia- 103-105°F and above

Thermometer is a device that measure temperature or a temperature gradient for recording body temperature. There are several types of thermometer are used such as Digital thermometer, Glass thermometer, Tympanic membrane thermometer, Disposable paper thermometer, Temperature sensitive strips and chemical Dot. Digital thermometer consists of a battery-powered control unit and a thermometer- sensitive probe connected to the unit by a thin cord.

Glass thermometer is a special instrument designed to measure the temperature of the body. It has two part, a bulb containing mercury and a stem in which the mercury can rise a bulb are of different size and shape.

2. Need of the Study

Temperature taking is the most frequently performed clinical observation and is predominantly a nursing task. Although the use of digital thermometer is gradually increasing but glass thermometer still most common device used in the clinical setting, especially in the developing countries in spite of having long time, danger of breakage, potential harm, and toxic vapour effects, difficulties in reading, and possibility to spread hospital acquired infections.

Venkatesh Periasami, Sridevi A. Naaraayan, Seetha Viswanathan April 2017 conducted a descriptive study to assess diagnostic accuracy of digital thermometer compared to mercury in glass thermometer for measuring temperature in children those admitted in paediatric ward at institute of child health and hospital for children, Egmore, Chennai. Pearson correlation coefficient and Bland Altman plot were used to observe agreements of the recordings on 92 sample aged 01 months to 12 years. The temperature was measured by placing glass thermometer at the axilla where as digital thermometer on the opposite axilla, but randomization of right and left axilla was carried out within the consecutive study subjects and measurements were taken simultaneously. The result shown there was a good correlation between mercury and digital thermometer recordings ($r=0.976$, $p<0.001$). It concluded that digital thermometer is as accurate as in glass mercury thermometer in recording temperature. The average time taken by the digital thermometer to record temperature is 88.03±17.07 seconds.[3]

Hadgu Gerensea May 2014 conducted a experimental study on comparison of body temperature among 05 min and 10 min glass mercury thermometer and digital thermometer in under 5 children with febrile illness axillary in Axum Saint Mary Hospital, Central zone of Tigray, Ethiopia. Correlational and bland Altman plot were used to observe the agreements of the recordings on 98 samples. The temperature was measured by placing glass thermometer (05 & 10min) at the same axilla where as digital thermometer on the opposite axilla, but randomization of right and left axilla was carried out within the consecutive study subjects and measurements

were taken simultaneously. The result shown that there is statistical significance (p<0.01)and clinical significance 0.2 F) were used. It concluded that there is good agreement and clinical nsignificant, some important disadvantages of glass thermometer and advantages of digital thermometer makes digital thermometer alternative to the traditional glass thermometer their variation in temperature is not likely to change any clinical decision.[4]

2.1. Statement of the problem

A comparative study to assess the reliability of the digital and glass thermometer in the adults admitted in all Male wards of Era Lucknow Medical College & Hospital Lucknow, U.P.

2.2. Research approach

The research approach for the present study is Quantitative (Non-experimental) research approach aim to assess the Reliability of the Digital and Glass Thermometer in patients admitted in all male wards Era,s Lucknow Medical College & Hospital Lucknow, U.P.

2.3. Research design

In this study, comparative (non- experimental) research design, patient is selected to assess the reliability of Digital and Glass Thermometer among adults admitted in all male wards Era Lucknow Medical Collage & Hospital Lucknow, U.P.

2.4. Dependent variable

Temperature.

2.5. Independent variable

Digital thermometer and glass thermometer.

2.6. Demographic variable

Age, sex, education, family income, diagnosis of the patient.

2.7. Setting of the study

In the present study, the Lucknow Medical College & Hospital Lucknow, U.P.

2.8. Population

The population of present study will be patients admitted in all male wards of Lucknow Medical College & Hospital Lucknow, U.P.

2.9. Sample

For the present study sample is Patients admitted in all male wards o Lucknow Medical College & Hospital Lucknow, U.P.

2.10. Sample size

For the study sample size consist of 60 adult admitted in all male wards of Lucknow Medical Collage & Hospital, Lucknow U.P.

2.11. Sampling technique

In the present study, non probability convenient sampling technique adopt select a sample of adult admitted in all male wards of Hospital Lucknow, U.P.

2.12. Inclusion criteria

1. Those who are admitted in all male wards
2. Patients who are willing to participate in the study.

2.13. Exclusion criteria

1. Those who are having surgery in axillary area.
2. Those who have upper extremity amputation.
3. Those who have fracture in upper extremities.
4. Those who admitted in all female wards.

2.14. Pilot study

Polit and Beck (2011) stated that pilot study is a small scale version or trail run designed to test the method to be used in a larger, more rigorous study. The purpose of the study is to find out the feasibility and reliability of the study. The data were collected from 28 November to 1 of December 2018 at ELMCH. The data was collected from 6 male patients by using non probability convenient sampling technique. Formal permission obtained from official. authorities of the hospital before approaching the subjects. Took written consent from the subjects as well as informed verbally and they were assured that their responses will be kept confidential and information will be used only for research purpose only and explain the procedure to the subjects. The maximum time for collecting the data 5-6 min per subjects.[5]

2.15. Ethical consideration

Keeping in mind the legal right of the subjects, only those male patients were included who are willing to participate. Written and verbal consent obtain from the subjects.

2.16. Method of data collection

The data was collected from 60 male patients who were admitted in all male wards of hospital by using non probability convenient sampling techniques. Prior to the

data collection procedure, formal permission were obtained from medical & nursing superintendent. Took the written consent from the subjects as well as informed verbally and they were assured that their responses will be kept confidential and information will be used only for research purpose only. For collecting readings of thermometer putting both the thermometer at the same time in axilla and record the readings.[6]

2.17. Plan for data analysis

Descriptive and inferential statistics was used for data analysis. The collected data will be presented in form of tables, diagrams and graphs. Mean, percentage, standard deviation, standard error, was used for descriptive statistics and z-test was used for inferential statistics

Section -1 Finding on demographic characteristics of the subjects.

Table 2: Frequency and percentage distribution of demographic characteristics of the subjects N=60

S. No.	Demographic variables	Frequency (N)	Frequency percentage (N%)
1	**Age (in years)**		
	a) 18-28	24	40
	b) 29-39	18	30
	c) 40-50	15	25
	d) 50-60	03	05
2	**Gender**		
	a) Male	60	100
	b) Female	00	00
3	**Educational status**		
	a) Illiterate	21	35
	b) Primary education	23	39
	c) Secondary education	08	13
	d) Graduation	08	13
4	**Religion**		
	a) Hindus	34	56
	b) Muslims	26	44
	c) Christians	00	00
	d) Others	00	00
5	**Occupation**		
	a) Unemployment	03	05
	b) Labour	30	50
	c) Private job	25	41
	d) Government job	02	04
6	**Marital status**		
	a) Married	46	76
	b) Unmarried	14	24
	c) Divorce	00	00
	d) Widower	00	00
7	**Family income**		
	a) 3000-5000	24	40
	b) 5001-7000	07	11
	c) 7001-9000	17	29
	d) 9001-11000	12	20

Table 1 reveals the frequency and percentage distribution of socio-demographic characteristics. A total 60 male patients were selected as sample to compare body temperature by using digital and glass thermometer. Distribution of study subjects according to age revealed that majority (40%) of male patients were in the age group of 18-28 years, followed by 29-39 years (30%), 40-50 years (25%) and 51-60 years (5%). As per their religions majority hindus (65%), muslim (44%). In context of educational status of patients majority (39%) belongs to primary school, secondary school and graduation (13%) remaining were illiterate (35%).

Regarding the occupational status of the patients mostly they are labourer (50%), private job (41%), unemployment (5%) and govt. servants are (4%). As per income of patients majority of patients belong to poor family (40%), lower class (11%), lower middle (29%), upper middle class (20%). In respect of marital status most of them became married (76%), remaining unmarried (24%). Hence, the above description showed that the sample were in homogeneous in characteristics except educational status, family monthly income, occupation and sample size which is well proved with Z test.

Table 3 after analysis and interpretation of collected data the calculated z-value of consecutive three days (0.06, 0.31, and 0.61) is less than tabulated z-value (0.97) at significance level ($p<0.05$). We rejected the hypothesis and accept the null hypothesis, therefore the research study conclude there is no significant difference between digital and glass thermometer. We rejected the hypothesis and accept the null hypothesis, therefore the research study conclude there is no significant difference between digital and glass thermometer.

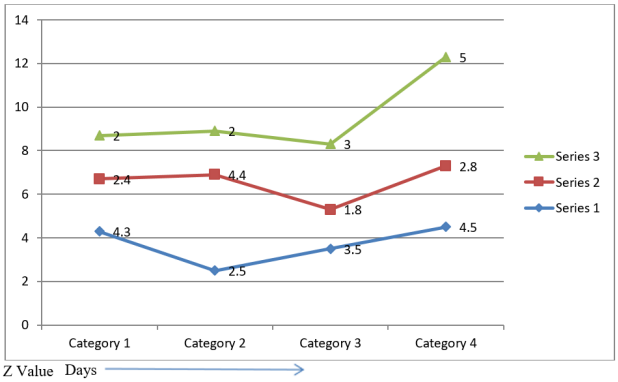

Fig. 1: Comparison of tubalated Z value (ZT) & calculated Z value (ZC)

3. Summary

The study objectives revealed to compare the body temperature by using digital and glass thermometer.

Table 3: Comparison the calculated data of temperature readings

Days	Type of thermometer	Total value of temp. readings	Mean	SD	SE	Z-test value
1	Digital	5722.4	95.37	2.19	0.33	0.06
	Glass	5723.8	95.39	1.31		
2	Digital	5726.4	95.39	1.91	0.29	0.31
	Glass	5732.6	95.54	1.22		
3	Digital	5734	95.56	2.13	0.31	0.61
	Glass	5714.3	95.2	1.04		

*Not significant Z-value at ($p< 0.05$)

The study attempted to examine the following hypothesis-

The study hypothesis (null hypothesis) was tested at P<0.05 level of significance. The study hypothesized that:-

H0**:** There will be no significant difference between digital and glass thermometer. The dependent variable was temperature. The independent variable was digital and glass thermometer. The socio demographic variable was age, gender, family income, diagnosis of the patient.

In this study Comparative (non-experimental) research design, patient is selected to assess the reliability of Digital and Glass Thermometer among adults admitted in all male wards o Lucknow Medical Collage & Hospital Lucknow, U.P. The study sample consists of 60 samples of adult male patients of Era Lucknow Medical Collage & Hospital, Lucknow. Non Probability convenient sampling technique simple random technique was adapted to select sample subjects. For generating data, demographic information. Pilot study was conducted on adults admitted in all male wards o Lucknow Medical Collage & Hospital Lucknow, U.P., Lucknow. The study was done to find the practicability and feasibility of the research design and it was found to be feasible and practical for conducting the study. The main study was done in the month of March 2018. The total sample size was 60 adult male who fulfilled the sample criteria. Analysis was based on the study objectives and hypothesis, using by both descriptive and inferential statistics. The descriptive statistics used were frequency, percentage, mean, standard deviation, standard error, and Z-test graphical presentation of obtained data.[7]

4. Limitations

The study was limited to

1. Those who are admitted in all male wards.
2. Patients who are willing to participate in the study.

5. Conclusion

The study was concluded that out of 60 study sample, majority of the male patient was in age group 18-28 years, primary education, had a family income 3000-5000 per month and their occupation was labour. Standard deviation of reading of the thermometer of the digital and glass thermometer (day 1)2.19, 1.31 (day 2) 1.91, 1.22 and (day 3) 2.13, 1.04 respectively. Standard error of the calculated data of digital and glass thermometer for consecutive for three days 0.33, 0.29, 0.31 and calculated Z value of consecutive three days 0.06, 0.31, 0.61 respectively is less than tabulated Z value (Z=0.97) at significance level (P<0.05) so the null hypothesis of the research study was acceptable it means there is no significant difference between digital and glass thermometer.

6. Recommandations

Keeping in view of the present research study findings, the following recommendations have been made:

1. A similar study can be conducted to check the reliability of the different types of thermometer used in current trends like chemical dot thermometer, tympanic membrane thermometer.
2. A similar study can be conducted among children and newborns.
3. We recommended use digital thermometer because it is environmentally safe.

7. Source of Funding

None.

8. Conflict of Interest

None.

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Cite this article: Muthukumaran A. A comparative study to assess the reliability of the digital and glass thermometer in the adults admitted in all male wards of Era medical college & hospital Lucknow, U.P.. *Southeast Asian J Health Prof* 2022;5(3):68-73.