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Original Research Article

Effectiveness of warm water sponging versus tepid sponging in stabilization of vital signs and facilitating comfort among children with pyrexia admitted to selected hospitals of Lucknow

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ABSTRACT

Background: Fever is most common phenomena in all age group as it is associated with various infectious and non-infectious processes interact with the host's defense mechanism. Sponging the child with tepid have been routinely used in treatment of fever for a long period of time. But it has been seen that tepid sponging develops additional discomfort. The present study aimed to find the relative effectiveness in terms of additional comfort, longer duration of maintaining vital signs and achieving in physiological hemodynamics.
Methods: A quasi-experimental study was conducted among 80 children in selected hospital, Lucknow by using non-probability total enumerative sampling technique. Children's comfort daisies and visual analogue fatigue scale was used to assess the level of comfort and fatigue.
Results: The comparison between warm water and tepid sponging group in respect of vital signs shows that there was no significant difference ($p>0.05$) between them at any stage of study. But warm water sponging was more significant ($p<0.05$) in facilitating comfort than tepid sponging among children with pyrexia.
Conclusions: This study suggests that both warm water sponging and tepid sponging were effective in reduction of vital signs but warm water sponging was more effective in facilitating comfort among children with pyrexia. Whereas in the level of fatigue there was no average changes were obtained.

Keywords: Effectiveness, Sponging, Vital signs, Pyrexia, Children, Comfort

INTRODUCTION

A wide range of childhood illnesses are accompanied by fever. Fever has been recognized as an important sign of diseases since the beginning of recorded history. Fever usually occurs as a result of the body's exposure to infecting micro-organism, immune complexes, or other sources of inflammation. In response to invading viruses or bacteria, circulating monocytes, lymphocytes and fixed-tissue macrophages release chemicals called cytokines that function as "endogenous pyrogens", including interleukin-1, interleukin-6, tumor necrosis factor (TNF) and interferon. These mediators, in turn, stimulate prostaglandin E2 production in the anterior hypothalamus, which then brings about a rise in the temperature set- point by a variety of physiological mechanism.[1] As the body temperature rises, the heart rate and respiratory rate generally increases to help the body cope while oxygen saturation can decrease slightly as tissue demand more oxygen. In children, fever can be defined as a rectal, oral, or axillary temperature greater than 38.3°C (101°F), 37.8°C (100°F), or 37.2°C (99°F), respectively.[2]

As per the National Family Health Survey (NHIS 2019) reported that fever affects 25.7 million people, including 7.0 million among children before 15 years old.[2] Approximately 180,000 patients ≤90 days old and 2.6 million patients 91 days to <2 years in age with fever present to US EDs annually.[3]

Most of the patients fully recover after a period of high body temperature, but patients exposed to higher temperatures over a prolonged period can be dangerous and cause serious complications, ranging from brain damage to death. There are so many deleterious consequences of fever among children which include dehydration, hallucination, delirium, febrile seizure.[4] A prospective hospital based study conducted in 2015 to find out the incidence of febrile convulsion in Kashmir. The findings revealed that out of 12012 children 545 children had febrile convulsions. Among febrile convulsions 379 children had typical febrile convulsion and 166 children had atypical febrile convulsions.[5] Hence, in order to prevent this serious complications of fever, so it is necessary for us to manage fever.

Management of fever can be done by using various pharmacological and non-pharmacological measures. Acetaminophen are the only drugs approved for treatment of fever in children but it can have severe consequences when overdose occurs such as hepatotoxicity, GI bleeding, renal failure, coma, seizures, and hepatic seizure. The non-pharmacological measures are used to manage fever includes undressing, fanning, cold sponging and tepid sponging. But it can cause additional discomfort like shivering, restlessness.

So, warm water sponging conceptually can alleviate this. Sponging with warm water causes the body temperature outside to be warm so the body will interpret that the temperature outside is hot enough, eventually the body will lower the temperature control in the brain so as not to increase the temperature of the body regulator, with the temperature outside warm will make the blood vessels in the skin edge widening and experiencing vasodilation which leads the skin pores to open and facilitate heat dissipation hence, there will be a decrease in body temperature.[6]

Therefore, the warm water sponging works in a two way that reduces a body temperature as well as it has soothing effect.

Objectives

Objectives of the study were to assess the pre intervention level of vital signs among children with pyrexia in both warm water sponging and tepid sponging group, to assess the post intervention level of vital signs among children with pyrexia in warm water sponging and tepid sponging group, to evaluate the effectiveness of warm water sponging than the tepid sponging in stabilization of vital signs, reduction of fatigue and facilitating comfort among children with pyrexia.

METHODS

It was quantitative research approach type of study. The present study was conducted at Balrampur hospital and Vivekananda Polyclinic Institute of Medical Sciences (VPIMS), Lucknow (Uttar Pradesh). Data was collected from May 2022 to June 2022.

Research design

The Quasi-experimental design (pre-test post-test repeated measures design with control group) was used.

In Table 1, OE1, OC1-assessing the pre intervention level of vital signs, comfort and fatigue before application of intervention in experimental and control group; XE-application of warm water sponging in experimental group, XC-application of tepid sponging in control group, OE2, OC2-assessing the post intervention level of vital signs, comfort and fatigue after at 15 minutes in experimental and control group, OE3, OC3-assessing the post intervention level of vital signs at 30 minutes in experimental and control group, OE4, OC4-assessing the post intervention level of vital signs at 45 minutes in experimental and control group, OE5, OC5-assessing the post intervention level of vital signs at 60 minutes in experimental and control group, and OE6, OC6-assessing the post intervention level of vital signs, comfort and fatigue at 120 minutes in experimental and control group.

Table 1: Schematic representation of research design.

Group	Pre-test	Intervention	Post-test				
Experimental	O_{E1}	X_E	O_{E2}	O_{E3}	O_{E4}	O_{E5}	O_{E6}
Control	O_{C1}	X_C	O_{C2}	O_{C3}	O_{C4}	O_{C5}	O_{C6}

Population

Children with pyrexia.

Target population

In this study, the target population was children between the age group of 1-10 years with body temperature 100-104°F admitted in selected hospital, Lucknow, U.P.

Accessible population

In this study, the accessible population was children between the age group of 1-10 years with body temperature 100-104°F admitted in VPIMS and Balrampur Hospital, Lucknow, U.P during the time of data collection and who met the inclusion criteria of the study.

Sample size

Sample size was 80.

Sampling technique

The sample was selected through the non- probability: total enumerative sampling technique.

Inclusion criteria

The study included the participants who were: children hospitalized with fever ranging from 100-104°F, children in the age group of 1-10 years, children with irrespective treatment with antipyretics and whose parents was willing to participate their children in the study.

Exclusion criteria

The study excluded participants who were: children those were contraindicated for sponging like, burns, head injury, septicemia, and open wounds, children with peripheral vascular disorder with or without loss of sensation, deep vein thrombosis, skin diseases, children who were unconscious and children who were critically ill (vital signs are unstable).

Description of tool

Section A

It contains socio-demographic and clinical profile of children.

Section B

It contains vital signs recording datasheet to record the pre and post level of vital signs after the application of warm water and tepid sponging.

Section C

Children's comfort daisies proposed by Katharine Kolcaba (1997).[7,8] This scale categorizes the child's comfort by the completion of comfort daisies scale. The scale was categorized as very good (4 score), sort of good (3 score), sort of bad (2 score), and very bad (1 score).

Section D

Observation checklist for assessing children's discomfort. The level of discomfort of children was assessed by using observation checklist in terms of four criteria–crying, shivering, irritable and restlessness.

Section E

Visual analogue fatigue scale developed by oncology nursing society.[9] This scale was used to assess the level of fatigue among admitted children with pyrexia. The total score can be categories of fatigue level: no fatigue (0 score), mild (1-3 score), moderate (4-6 score), severe (7-10 score).

Data collection procedure

After obtaining ethical approval from the ethical committee of VPIMS, Lucknow formal permission was obtained from the selected Hospitals, Lucknow, U.P. The samples were selected as per the screening tool. The purpose of the study was explained to them.

Eligible children were assigned in control and experimental group sequentially by using total enumerative sampling technique.

Pre intervention level of vital signs were assessed by using standardized digital thermometer, pulse oximeter and recorded on vital signs recording data sheet. Then comfort level was assessed by using children's comfort daisies and fatigue level was assessed by using visual analogue fatigue scale in both experimental and control group. Intervention was followed by administration of warm water sponging for experimental group and tepid sponging for control group for 15-20 minutes by following specified steps. While giving intervention, the checklist for observation to assess the children's discomfort was used. Post-test was obtained after at 15 minutes of the intervention from experimental and control group.

Post intervention level of vital signs were assessed five times at 15 min, 30 min, 45 min, 60 min and 120 min after completion of intervention by using standardized digital thermometer and pulse oximeter. The findings of the vital signs were recorded in the data sheet. Post intervention level of comfort and fatigue were assessed two times after completion of intervention at 15 min, 120 min by using children's comfort daisies and visual analogue fatigue scale.

RESULTS

Distribution of participants based on their demographic variable (age, height, weight, BMI, duration of fever) in warm water sponging and tepid sponging group

The study findings show that among 80 children, the average age, height, weight, BMI and duration of fever was 5.13 (±3.10) years, 100.25 (±17.73) cm, 14.95 (±5.25) kg, 14.58 (±2.55) kg/m^2, 2.85 (±1.08) days. For the children who received warm water sponging (n=40) the average age, height, weight, BMI and duration of fever was 5.44 (±3.25) years, 100.98 (±19.01) cm, 15.43 (±5.66) kg, 14.85 (±3.30) kg/m^2, 2.95 (±1.08) days. For the children who received tepid sponging (n=40) the average age was 4.81 (±2.95) years, 99.53 (±16.56) cm, 14.48 (±4.83) kg, 14.30 (±1.45) kg/m^2, and 2.75 (±1.08) days.

Distribution of participants based on their demographic variable (gender, medical diagnosis) in warm water sponging and tepid sponging group

The study findings show that among 80 children about 53 children were males and 27 were females. Among the 53

males' children 45.3% were treated with warm water sponging and 54.7% were treated with tepid sponging whereas among 27 female children 59.3% were treated with warm water sponging and 40.7% were treated with tepid sponging. Among the 80 children, 5.0% were suffering from dengue, 8.8% were suffering from typhoid, 8.8% were suffering from meningitis, 6.3% were suffering from enteric fever, 8.8% were suffering from malaria, 5.0% were suffering from febrile seizure, 6.3% were suffering from LRTI, 3.8% were suffering from bronchial asthma, 11.3% were suffering from pyrexia of unknown origin, 12.5% were suffering from acute gastroenteritis, 6.3% were suffering from jaundice, 11.3% were suffering from pneumonia and 6.3% were suffering from dysentery. In warm water sponging group, among the 40 children 7.5% were suffering from dengue, 10.0% were suffering from typhoid, 7.5% were suffering from meningitis, 5.0% were suffering from enteric fever, 7.5% were suffering from malaria, 5.0% were suffering from febrile seizure, 5.0% were suffering from LRTI, 2.5% were suffering from bronchial asthma, 12.5% were suffering from pyrexia of unknown origin, 15.0% were suffering from acute gastroenteritis, 5.0% were suffering from jaundice, 10.0% were suffering from pneumonia and 7.5% were suffering from dysentery. In tepid sponging group, among the 40 children 2.5% were suffering from dengue, 7.5% were suffering from typhoid, 10.0% were suffering from meningitis, 7.5% were suffering from enteric fever, 10.0% were suffering from malaria, 5.0% were suffering from febrile seizure, 7.5% were suffering from LRTI, 5.0% were suffering from bronchial asthma, 10.0% were suffering from pyrexia of unknown origin, 10.0% were suffering from acute gastroenteritis, 7.5% were suffering from jaundice, 12.5% were suffering from pneumonia and 5.0% were suffering from dysentery.

Clinical profile of admitted children with pyrexia in warm water sponging and tepid sponging group

The study findings show that among all the admitted children with pyrexia were treated with antipyretic and antibiotics. The route of administration of the treatment was intravenous.

Difference between the mean pre intervention and post intervention level of vital signs (temperature, pulse rate, respiration rate, SpO_2), level of fatigue and comfort in both warm water sponging and tepid sponging group

The study findings show that in both group after application of warm water sponging and tepid sponging, there was an average reduction obtained in the level of temperature, pulse rate and respiration rate. But there was an average increase obtained in the percentage of SpO_2 and comfort level. In both groups due to warm water sponging and tepid sponging, no average changes were obtained in the level of fatigue. Therefore, no further statistical analysis was used for the same.

After intervention effectiveness of warm water sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia

The study findings show that the calculated F-value for the vital signs i.e. temperature, pulse rate, respiration rate, SpO_2 and comfort was 819.57, 50.55, 40.65, 8.87, 295.15 at 0.05 level of significance which shows that due to warm water sponging there was a statistically significant reduction in the level of temperature, pulse rate, respiration rate but there was significant increase in the SpO_2 and comfort level in experimental group (warm water sponging group).

After intervention effectiveness of tepid sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia

The study findings show that the calculated F-value for the vital signs i.e. temperature, pulse rate, respiration rate, SpO_2 and comfort was 603.67, 36.96, 31.59, 18.23, 70.67 at 0.05 level of significance which shows that due to tepid sponging there was a statistically significant reduction in the level of temperature, pulse rate, respiration rate but there was significant increase in the SpO_2 and comfort level in control group (tepid sponging group).

Comparison of effectiveness of warm water sponging than the tepid sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia

The study findings show that after intervention the mean post level of temperature in warm water sponging and tepid sponging group at 15, 30, 45, 60 and 120 minutes were (0.87±0.26 °F, 0.79±0.30 °F), (1.22±0.30 °F, 1.18±0.37 °F), (1.63±0.33 °F, 1.63±0.38 °F), (2.16±0.35 °F, 2.06±0.40 °F) and (2.86±0.42 °F, 0.40±0.74 °F) respectively. The comparison shows that there was no significant difference found between them at any stage of study. Hence, both tepid and warm water sponging were effective in reducing body temperature. For the pulse rate after intervention the mean change in the pulse rate in warm water sponging and tepid sponging group at 15 minutes was (1.40±2.49, 1.60±1.93) at 30 minutes was (2.15±2.91, 2.65±2.41) at 45 minutes (3.90±3.59, 4.15±3.02), at 60 minutes (4.80±3.99, 6.00±4.41) at 120 minutes (6.85±4.10, 9.05±7.91). The calculated "t" value at 15, 30, 45, 60, 120 minutes were 0.40, 0.84, 0.34, 1.27, 1.56 which were less than the table value i.e., 2 were not significant at 0.05 level. So it is concluded that due to both warm water sponging and tepid sponging, the pulse rate was not significantly different at any stage of the study. For the respiration rate after intervention the mean change in the respiration rate in warm water sponging and tepid sponging group at 15 minutes was (3.00±2.94, 2.15±3.80) at 30 minutes was (4.50±3.76, 2.65±3.85) at 45 minutes (5.45±4.30, 3.60±4.25) at 60 minutes (6.25±4.73,

4.15±4.54) at 120 minutes (6.55±4.37, 5.65±4.41). The calculated "t" value at 15, 45, 120 minutes was 1.12, 1.94, 0.92 which was less than the table value i.e., 2 were not significant at 0.05 level. But the calculated "t" value at 30 and 60 minutes was 2.17 and 2.03 which was more than the table value i.e., 2 were significant at 0.05 level. So it is concluded that due to both warm water sponging and tepid sponging, the respiration rate was not significantly different at any stage of the study except at 30 and 60 minutes. For the SpO_2 after intervention the mean change in the SpO_2 in warm water sponging and tepid sponging group at 15 minutes was (0.25±0.71, 0.28±0.72) at 30 minutes was (0.15±1.90, 0.58±0.90) at 45 minutes (0.45±0.85, 0.50±0.96) at 60 minutes (0.88±0.91, 0.80±1.09) at 120 minutes (1.13±1.09, 1.23±1.14). The calculated "t" value at 15, 30, 45, 60, 120 minutes were 0.16, 1.28, 0.25, 0.33, 0.40 which were less than the table value i.e., 2 were not significant at 0.05 level. So it is concluded that due to both warm water sponging and tepid sponging, the SpO_2 was not significantly different at any stage of the study. For comfort after intervention the mean change in the level of comfort in warm water sponging and tepid sponging group at 15 minutes was (1.88±0.65, 0.55±0.55) at 120 minutes (2.08±0.69, 1.03±0.58). The calculated "t" value at 15, 120 minutes were 9.84, 7.36 which were more than the table value i.e., 2 were highly significant at (p=0.05) level. So it is concluded that due to warm water sponging for increase the level of comfort was significantly larger than the tepid sponging.

Distribution of the sample in experimental and control group according to the children's discomfort

The study findings show that in the experimental group (n=40) all the children were felt comfortable due to application of warm water sponging while in control group (n=40) about 20% children were cried, 77.5% were got irritated and 17.5% were felt restless due to application of tepid sponging.

Table 2: Distribution of participants based on their demographic variable (age, height, weight, BMI, duration of fever) in warm water sponging and tepid sponging group.

Variables	Overall (n=80)		Warm water sponging (experimental n=40)		Tepid sponging (control n=40)	
	Mean	SD	Mean	SD	Mean	SD
Age of child in years	5.13	3.10	5.44	3.25	4.81	2.95
Height of child (in cm)	100.25	17.73	100.98	19.01	99.53	16.56
Weight of child (in kg)	14.95	5.25	15.43	5.66	14.48	4.83
BMI of child (in kg per meter square)	14.58	2.55	14.85	3.30	14.30	1.45
Duration of fever	2.85	1.08	2.95	1.08	2.75	1.08

Table 3: Distribution of participants based on their demographic variable (gender, medical diagnosis) in warm water sponging and tepid sponging group.

Variable	Warm water sponging (experimental n=40)		Tepid sponging (control n=40)		Total (n=80)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Gender						
Male	24	45.3	29	54.7	53	100.0
Female	16	59.3	11	40.7	27	100.0
Medical diagnosis of child						
Dengue	3	7.5	1	2.5	4	5.0
Typhoid	4	10.0	3	7.5	7	8.8
Meningitis	3	7.5	4	10.0	7	8.8
Enteric fever	2	5.0	3	7.5	5	6.2
Malaria	3	7.5	4	10.0	7	8.8
Febrile seizure	2	5.0	2	5.0	4	5.0
LRTI	2	5.0	3	7.5	5	6.2
Bronchial asthma	1	2.5	2	5.0	3	3.8
Pyrexia of unknown region	5	12.5	4	10.0	9	11.2
Acute gastroenteritis	6	15.0	4	10.0	10	12.6
Jaundice	2	5.0	3	7.5	5	6.2
Pneumonia	4	10.0	5	12.5	9	11.2
Dysentery	3	7.5	2	5.0	5	6.2

Table 4: Difference between the mean pre intervention and post intervention level of vital signs (temperature, pulse rate, respiration rate, SpO_2), level of fatigue and comfort in both warm water sponging and tepid sponging group.

Variable	Warm water sponging (experimental n=40)		Tepid sponging (control n=40)	
	Mean	SD	Mean	SD
Temperature at				
Pre intervention	101.78	0.43	101.73	0.46
15 min of post intervention	100.91	0.46	100.94	0.48
30 min of post intervention	100.57	0.47	100.55	0.51
45 min of post intervention	100.16	0.49	100.10	0.42
60 min of post intervention	99.63	0.46	99.67	0.45
120 min of post intervention	98.92	0.36	98.93	0.37
Pulse rate at				
Pre intervention	116.90	3.62	119.25	3.64
15 min of post intervention	115.50	3.10	117.65	2.71
30 min of post intervention	114.75	3.03	116.60	2.41
45 min of post intervention	113.00	2.94	115.10	2.35
60 min of post intervention	112.10	3.73	113.25	2.43
120 min of post intervention	110.05	3.86	110.20	6.98
Respiration rate at				
Pre intervention	37.10	5.28	36.55	3.90
15 min of post intervention	34.10	5.34	34.40	3.95
30 min of post intervention	32.60	4.99	33.90	3.48
45 min of post intervention	31.65	4.44	32.95	3.36
60 min of post intervention	30.85	3.17	32.40	3.18
120 min of post intervention	30.55	3.17	30.90	2.86
SpO_2 at				
Pre intervention	97.48	0.78	97.38	0.74
15 min of post intervention	97.73	0.64	97.65	0.53
30 min of post intervention	97.63	1.88	97.95	0.68
45 min of post intervention	97.93	0.69	97.88	0.65
60 min of post intervention	98.35	0.80	98.18	0.90
120 min of post intervention	98.60	0.90	98.60	0.87
Fatigue at				
Pre intervention	1.55	0.50	1.58	0.50
15 min of post intervention	1.55	0.50	1.58	0.50
120 min of intervention	1.55	0.50	1.58	0.50
Comfort at				
Pre intervention	1.50	0.51	1.43	0.50
15 min of post intervention	3.38	0.49	1.98	0.62
120 min of intervention	3.58	0.50	2.45	0.55

Table 5: After intervention effectiveness of warm water sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia (n=40).

Source	Sum of squares	Df	Mean square	F	P value
For temperature					
Temperature	200.39	5	40.08	819.57	<0.001*
Error (temperature)	9.54	195	0.05		
Total	209.93	200			
Pulse rate	1238.13	5	247.63	50.55	<0.001*
Error (pulse rate)	955.20	195	4.90		
Total	2193.33	200			
For respiration rate					
Respiration rate	1216.28	5	243.26	40.65	<0.001*
Error (respiration rate)	1167.05	195	5.98		

Continued.

Source	Sum of squares	Df	Mean square	F	P value
Total	2383.33	200			
For SpO2					
SpO_2	38.60	5	7.72	8.87	<0.001*
Error (SpO_2)	169.73	195	0.87		
Total	208.33	200			
For comfort					
Comfort	104.82	2	52.41	295.15	<0.001*
Error (comfort)	13.85	78	0.18		
Total	118.67	80.000			

*Indicates significant at p<0.05

Table 6: After intervention effectiveness of tepid sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia (n=40).

Source	Sum of squares	Df	Mean square	F	P value
For temperature					
Temperature	192.05	5	38.41	603.67	<0.001*
Error (temperature)	12.41	195	0.06		
Total	204.46	200			
For pulse rate					
Pulse rate	2122.28	5	424.46	36.96	<0.001*
Error (pulse rate)	2239.72	195	11.49		
Total	4362.00	200			
For respiration rate					
Respiration rate	741.73	5	148.35	31.59	<0.001*
Error (respiration rate)	915.60	195	4.70		
Total	1657.33	200			
For SpO2					
SpO_2	35.94	5	7.19	18.23	<0.001*
Error (SpO_2)	76.90	195	0.39		
Total	112.83	200			
For comfort					
Comfort	21.05	2	10.53	70.67	<0.001*
Error (comfort)	11.62	78	0.15		
Total	32.67	80			

*Indicates significant at p<0.05

Table 7: Comparison of effectiveness of warm water sponging than the tepid sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia (n=80).

Variable	Warm water sponging (experimental n=40)		Tepid sponging (control n=40)		t-statistic	P value
	Mean	SD	Mean	SD		
Reduction in temperature from pre temperature						
At 15 min of intervention	0.87	0.26	0.79	0.30	1.29	0.202
At 30 min of intervention	1.22	0.30	1.18	0.37	0.53	0.595
At 45 min of intervention	1.63	0.33	1.63	0.38	0.00	1.000
At 60 min of intervention	2.16	0.35	2.06	0.40	1.18	0.241
At 120 min of intervention	2.86	0.42	2.79	0.40	0.74	0.461
Reduction in pulse rate from pre pulse rate						
At 15 min of intervention	1.40	2.49	1.60	1.93	0.40	0.689
At 30 min of intervention	2.15	2.91	2.65	2.41	0.84	0.406
At 45 min of intervention	3.90	3.59	4.15	3.02	0.34	0.737
At 60 min of intervention	4.80	3.99	6.00	4.41	1.27	0.206
At 120 min of intervention	6.85	4.10	9.05	7.91	1.56	0.122

Continued.

Variable	Warm water sponging (experimental n=40)		Tepid sponging (control n=40)		t-statistic	P value
	Mean	SD	Mean	SD		
Reduction in respiration rate from pre respiration rate						
At 15 min of intervention	3.00	2.94	2.15	3.80	1.12	0.266
At 30 min of intervention	4.50	3.76	2.65	3.85	2.17	0.033*
At 45 min of intervention	5.45	4.30	3.60	4.25	1.94	0.057
At 60 min of intervention	6.25	4.73	4.15	4.54	2.03	0.046*
At 120 min of intervention	6.55	4.37	5.65	4.41	0.92	0.362
Increase in SpO_2 from pre SpO_2						
At 15 min of intervention	-0.25	0.71	-0.28	0.72	0.16	0.876
At 30 min of intervention	-0.15	1.90	-0.58	0.90	1.28	0.205
At 45 min of intervention	-0.45	0.85	-0.50	0.96	0.25	0.806
At 60 min of intervention	-0.88	0.91	-0.80	1.09	0.33	0.739
At 120 min of intervention	-1.13	1.09	-1.23	1.14	0.40	0.690
Increase in comfort from pre comfort						
At 15 min of intervention	-1.88	0.65	-0.55	0.55	-9.84	<0.001*
At 120 min of intervention	-2.08	0.69	-1.03	0.58	-7.36	<0.001*

*Indicates significant at p<0.05

Table 8: Distribution of the sample in experimental and control group according to the children's discomfort (n=80).

Criteria	Observation	Warm water sponging (experimental n=40)		Tepid sponging (control n=40)	
		Frequency	Percent	Frequency	Percent
Crying	Absent	40	100	32	80
	Present	00	00	08	20
Shivering	Absent	40	100	40	100
	Present	00	00	00	00
Irritable	Absent	40	100	31	77.5
	Present	00	00	09	22.5
Restlessness	Absent	40	100	33	82.5
	Present	00	00	07	17.5

DISCUSSION

Distribution of participants based on their demographic variable (age, height, weight, BMI, duration of fever) in warm water sponging and tepid sponging group

The study findings show that among 80 children, the average age, height, weight, BMI and duration of fever was 5.13 (±3.10) years, 100.25 (±17.73) cm, 14.95 (±5.25) kg, 14.58 (±2.55) kg/m^2, 2.85(±1.08) days. For the children who received warm water sponging (n=40) the average age, height, weight, BMI and duration of fever was 5.44 (±3.25) years, 100.98 (±19.01) cm, 15.43 (±5.66) kg, 14.85 (±3.30) kg/m^2, 2.95 (±1.08) days. For the children who received tepid sponging (n=40) the average age was 4.81 (±2.95) years, 99.53 (±16.56) cm, 14.48 (±4.83) kg, 14.30 (±1.45) kg/m^2, 2.75 (±1.08) days.

Distribution of participants based on their demographic variable (gender, medical diagnosis) in warm water sponging and tepid sponging group

The study findings show that among 80 children about 53 children were males and 27 were females. Among the 53 male children 45.3% were treated with warm water sponging and 54.7% were treated with tepid sponging whereas among 27 female children 59.3% were treated with warm water sponging and 40.7% were treated with tepid sponging. Among the 80 children, 5.0% were suffering from dengue, 8.8% were suffering from typhoid, 8.8% were suffering from meningitis, 6.3% were suffering from enteric fever, 8.8% were suffering from malaria, 5.0% were suffering from febrile seizure, 6.3% were suffering from LRTI, 3.8% were suffering from bronchial asthma, 11.3% were suffering from pyrexia of unknown origin, 12.5% were suffering from acute gastroenteritis, 6.3% were suffering from jaundice, 11.3% were suffering from pneumonia and 6.3% were suffering from dysentery. In warm water sponging group, among the 40 children 7.5% were suffering from dengue, 10.0% were suffering from typhoid, 7.5% were suffering from meningitis, 5.0% were suffering from enteric fever, 7.5% were suffering from malaria, 5.0% were suffering from febrile seizure, 5.0% were suffering from LRTI, 2.5% were suffering from bronchial asthma, 12.5% were suffering from pyrexia of unknown origin, 15.0% were suffering from acute gastroenteritis, 5.0% were suffering from jaundice, 10.0% were suffering from pneumonia and 7.5% were suffering

from dysentery. In tepid sponging group, among the 40 children 2.5% were suffering from dengue, 7.5% were suffering from typhoid, 10.0% were suffering from meningitis, 7.5% were suffering from enteric fever, 10.0% were suffering from malaria, 5.0% were suffering from febrile seizure, 7.5% were suffering from LRTI, 5.0% were suffering from bronchial asthma, 10.0% were suffering from pyrexia of unknown origin, 10.0% were suffering from acute gastroenteritis, 7.5% were suffering from jaundice, 12.5% were suffering from pneumonia and 5.0% were suffering from dysentery.

Clinical profile of admitted children with pyrexia in warm water sponging and tepid sponging group

The study findings show that among all the admitted children with pyrexia were treated with antipyretic and antibiotics. The route of administration of the treatment was intravenous.

Difference between the mean pre intervention and post intervention level of vital signs (temperature, pulse rate, respiration rate, SpO_2), level of fatigue and comfort in both warm water sponging and tepid sponging group

The study findings show that in both group after application of warm water sponging and tepid sponging, there was an average reduction obtained in the level of temperature, pulse rate and respiration rate. But there was an average increase obtained in the percentage of SpO_2 and comfort level. For fatigue in both warm water and tepid sponging group found that fatigue associated with fever not got relieved because the reasoned may be the fatigue is due to underlying disease process but not due to fever solely. Therefore, no further statistical analysis was used for the same.

After intervention effectiveness of warm water sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia

The study findings show that the calculated F-value for the vital signs i.e. temperature, pulse rate, respiration rate, SpO_2 and comfort was 819.57, 50.55, 40.65, 8.87, 295.15 at 0.05 level of significance which shows that due to warm water sponging there was a statistically significant reduction in the level of temperature, pulse rate, respiration rate but there was significant increase in the SpO_2 and comfort level in experimental group (warm water sponging group).

After intervention effectiveness of tepid sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia

The study findings show that the calculated F-value for the vital signs i.e. temperature, pulse rate, respiration rate, SpO_2 and comfort was 603.67, 36.96, 31.59, 18.23, 70.67 at 0.05 level of significance which shows that due to tepid sponging there was a statistically significant reduction in the level of temperature, pulse rate, respiration rate but there was significant increase in the SpO_2 and comfort level in control group (tepid sponging group).

Comparison of effectiveness of warm water sponging than the tepid sponging in stabilization of vital signs (temperature, pulse rate, respiration rate, SpO_2) and facilitating comfort among children with pyrexia

The study findings show that after intervention the mean post level of temperature in warm water sponging and tepid sponging group at 15, 30, 45, 60 and 120 minutes were (0.87±0.26 °F,0.79±0.30 °F), (1.22±0.30 °F, 1.18±0.37 °F), (1.63±0.33 °F, 1.63±0.38 °F), (2.16±0.35 °F, 2.06±0.40 °F) and (2.86±0.42 °F, 0.40±0.74 °F) respectively. The comparison shows that there was no significant difference found between them at any stage of study. Hence, both tepid and warm water sponging were effective in reducing body temperature. For the pulse rate after intervention the mean change in the pulse rate in warm water sponging and tepid sponging group at 15 minutes was (1.40±2.49, 1.60±1.93) at 30 minutes was (2.15±2.91, 2.65±2.41) at 45 minutes (3.90±3.59, 4.15±3.02), at 60 minutes (4.80±3.99, 6.00±4.41) at 120 minutes (6.85±4.10, 9.05±7.91). The calculated "t" value at 15, 30, 45, 60, 120 minutes were 0.40, 0.84, 0.34, 1.27, 1.56 which were less than the table value i.e., 2 were not significant at 0.05 level. So it is concluded that due to both warm water sponging and tepid sponging, the pulse rate was not significantly different at any stage of the study. For the respiration rate after intervention the mean change in the respiration rate in warm water sponging and tepid sponging group at 15 minutes was (3.00±2.94, 2.15±3.80) at 30 minutes was (4.50±3.76, 2.65±3.85) at 45 minutes (5.45±4.30, 3.60±4.25) at 60 minutes (6.25±4.73, 4.15±4.54) at 120 minutes (6.55±4.37, 5.65±4.41). The calculated "t" value at 15, 45, 120 minutes was 1.12, 1.94, 0.92 which was less than the table value i.e., 2 were not significant at 0.05 level. But the calculated "t" value at 30 and 60 minutes was 2.17 and 2.03 which was more than the table value i.e., 2 were significant at 0.05 level. So it is concluded that due to both warm water sponging and tepid sponging, the respiration rate was not significantly different at any stage of the study except at 30 and 60 minutes. For the SpO_2 after intervention the mean change in the SpO_2 in warm water sponging and tepid sponging group at 15 minutes was (0.25±0.71, 0.28±0.72) at 30 minutes was (0.15±1.90, 0.58±0.90) at 45 minutes (0.45±0.85, 0.50±0.96) at 60 minutes (0.88±0.91, 0.80±1.09) at 120 minutes (1.13±1.09, 1.23±1.14). The calculated "t" value at 15, 30, 45, 60, 120 minutes were 0.16, 1.28, 0.25, 0.33, 0.40 which were less than the table value i.e., 2 were not significant at 0.05 level. So it is concluded that due to both warm water sponging and tepid sponging, the SpO_2 was not significantly different at any stage of the study. For comfort after intervention the mean change in the level of comfort in warm water sponging and tepid sponging group at 15 minutes was (1.88±0.65,

0.55±0.55) at 120 minutes (2.08±0.69, 1.03±0.58). The calculated "t" value at 15, 120 minutes were 9.84, 7.36 which were more than the table value i.e., 2 were highly significant at (p=0.05) level. So it is concluded that due to warm water sponging for increase the level of comfort was significantly larger than the tepid sponging. Hence, the findings showed that there was no significant difference between warm water sponging and tepid sponging in stabilization of vital signs i.e., temperature, pulse rate, respiration rate, SpO_2. But there was significant effect of warm water sponging in facilitating comfort among children with pyrexia. Thus, the H_2 of this research study was accepted for the comfort and rejected for vital signs. These findings were supported by Jose et al, conducted a quasi-experimental study to assess the effect of tepid sponging versus warm sponging on body temperature and comfort among 78 under-five children with pyrexia.[10] The study results revealed there was significant reduction (p<0.001) in body temperature during both procedures, but no statistically significant difference (p=0.25) was observed between tepid sponging and warm sponging in reducing body temperature. The mean of comfort level during warm sponging (69.97) was higher than tepid sponging (37.05). The obtained "t" value for comfort (-42.94) was statistically significant (p<0.001). Similarly, another study conducted by Mandal et al showed that the calculated "t" value among the mean physiological parameters between experimental and control group at 2nd observation for temperature, pulse rate, respiration rate was 6.2, 2.13, 2.21 and at 3rd observation was 6.5,7.8,5.84 at 0.05 level of significance which shows that an average reduction of physiological parameters, (i.e., axillary temperature, pulse rate, respiration rate) after giving warm water foot bath therapy in experimental group.[11]

Distribution of the sample in experimental and control group according to the children's discomfort

The study findings show that in the experimental group (n=40) all the children were felt comfortable due to application of warm water sponging while in control group (n=40) about 20% children were cried, 77.5% were got irritated and 17.5% were felt restless due to application of tepid sponging. These findings were supported by Chetak et al, result revealed that irritability was observed in 53 children in tepid sponging with paracetamol group and in only three of antipyretic alone group.[12] Chills were observed in 46 children in tepid sponging with paracetamol group and in only one of the antipyretic group. Goosebumps were noticed only in 10 children in tepid sponging with paracetamol group. Among 254 children in only antipyretic group, 96.9% had no discomfort whereas among 246 children in tepid sponging with paracetamol group, only 55.7% had no discomfort. Four children among only antipyretic group had vomiting.

Limitations

Some limitation was found by the researcher during the research study period such as study was conducted on small sample size for a short period of time and other antibiotic treatment may affect the study findings.

CONCLUSION

From the finding of the study, it has been observed that there was no significant difference (p>0.05) found between warm water sponging and tepid sponging in regards of body temperature, pulse rate, respiration rate, SpO_2 at any stage of study. Hence, both tepid and warm water sponging were effective in stabilization of vital signs. But warm water sponging was significantly (p≤0.05) more effective in facilitating comfort than tepid sponging in patient with pyrexia.

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