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A comparative study on the effectiveness of warm and cold water sponging to Children with Pyrexia in a Selected Hospital at Mangalore

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Abstract

Fever is a common symptom of infection in children that causes significant discomfort, yet clinical evidence comparing physical antipyretic methods remains limited. This study aimed to compare the effectiveness of cold and warm water sponging in reducing fever and assess behavioural responses among pyrexic children. Using a quasi-experimental pre-test post-test control group design, 60 children with pyrexia were randomly assigned equally (n = 20 each) to a control group (Group I), cold water sponging group (Group II), or warm water sponging group (Group III). Physiological parameters and behavioural responses were recorded via observation and an observational checklist, and analysed using descriptive statistics, ANOVA, 't'-test, and Tukey HSD. Significant difference was found in the mean temperature among 3 groups at 15th minute ($F_{1,59}$= 13.644), 30th minute ($F_{1,59}$= 14.572), 45th minute ($F_{1,59}$= 8.040), and 60th minute ($F_{1,59}$= 5.174) after intervention at 0.05 level of significance.

The mean percentage scores of behavioural responses were 36% and 19% in group II and group III respectively. The 't' value showed significant difference between 2 groups (t= 4.158, P<0.05). Children in group II showed higher level of discomfort. The result shows that cold and warn water sponging are effective in reduction of body temperature and warn water sponging was found to be more effective than cold water sponging.

Key words: Cold water sponging, warm water sponging, pyrexia, discomfort.

I Introduction

Child health is fundamental to national development, yet childhood illnesses remain a major burden on healthcare delivery systems, with pyrexia being a predominant symptom. In India, where under-five mortality was 74 per 1,000 children in 2005, 92% of children experience fever, and over 75% of pediatric government hospital admissions involve complaints of fever, body ache, joint pain, and loss of appetite. Although antipyretics such as paracetamol are widely used as safer pharmacological options, repeated doses or narrow therapeutic margins carry significant risks of overdose and hepatotoxicity, particularly in children under two years of age[3,4,5,6].

Consequently, external cooling measures—including cool environments, light clothing, and sponging—are frequently combined with antipyretics to promote heat loss through conduction, convection, and evaporation[1,2]. While randomized trials show that tepid sponging reduces temperature more rapidly within the first 30 minutes than antipyretics alone[9] and offers greater comfort than cold sponging—which can trigger vasoconstriction, shivering, and rebound temperature elevation[10]—cold sponging remains widely practiced. Therefore, a comparative evaluation of warm and cold sponging is essential to establish safe, non-toxic, evidence-based nursing care for febrile children.

Need for the study

Pyrexia is a common physiological defense response to pathogens[11] that accounts for over 30% of large urban pediatric hospital visits and 19–30% of office-based pediatric encounters[12,19]. Despite its frequency, parental misconceptions and "fever phobia"—with surveys showing over 70% of parents have poor knowledge and 95% fear undue body damage—often lead to inappropriate interventions[15,17]. At the same time, nursing management of childhood fever frequently lacks research-based consistency; a survey of 731 emergency department nurses revealed wide variations in intervention thresholds (37^0C to 40^0C) and sponging practices[21,22].

Although water sponging has been used for centuries and clinical studies indicate that combining acetaminophen with sponging accelerates cooling—with tepid water providing greater comfort than ice water or alcohol[20]—there is still no consensus on the optimal water temperature[20,22]. Driven by clinical observation of both warm and cold water sponging practices, the investigator undertook this study to compare the effectiveness of warm and cold water sponging among children with pyrexia in a selected hospital at Mangalore.

Statement of the problem

A comparative study on the effectiveness of arm and cold water sponging to children with ppyrexia in a selected hospital at Mangalore.

Objectives of the study

- To determine the effect of cold water sponging(group II) and warm water sponging (group III) in the reduction of body temperature among children with pyrexia.
- To assess the behavioural response among pyrexic children during and cold and warm water sponging(group I and group II).
- To compare the effect of warm and cold water sponging in the reduction of body temperature in children with pyrexia.
- To compare the difference in reduction of body temperature among group I, group II, and group III.

Operational definitions

1. Effectiveness: ‘Effectiveness’ refers to the extent to which a febrile child will regain normal body temperature and remain comfortable following cold and warm water sponging as measured against temperature and level of discomfort by behavioural observational checklist.
2. Sponging: ‘Sponging’ refers to wiping the whole body with a wet sponge cloth, in the child’s preferred comfortable position, through the use of either cold or warm water as an intervention in the reduction of elevated body temperature to normal limits.
3. Cold water sponging: In this study ‘cold water sponging’ refers to sponging the child with increased body temperature using cold water. The temperature of water ranges from 60-65°F measured using a water thermometer.

4. Warm water sponging: In this study 'warm water sponging' refers to sponging the child with elevated body temperature using warm water that ranges between 95-100°F measured using a water thermometer.
5. Children: Febrile children in the age group of 1-6 years admitted as inpatients to the hospital with the body temperature between 100-102.8°F.
6. Behavioural response: It is the bodily responses manifested by the children during cold and warm water sponging which will be measured against an observational checklist. The measured body responses of febrile children are categorised as

- Very high discomfort 20-27
- High discomfort 14-19
- Moderate discomfort 7-13
- Mild discomfort 1-6

Delimitations

1. The study is limited to children in the age group of 1-6 years.
2. The study is limited to children with pyrexia of 100-102.8°F.

II Methodology

This chapter deals with the methodology selected by the investigator to study the effectiveness of warın water and cold water sponging to children with pyrexia in a selected hospital at Mangalore.

Research approach: An evaluative research approach has been adopted in this study. Evaluative research is an applied form of research that involves finding out how well a programme, practice, procedure or policy is working. The main goal is to assess or evaluate the success of the programme".

Research design: The research design provides the backbone structure of a study. It is the researcher's overall plan for obtaining answers to the research questions or for testing the research hypotheses. The research design adopted for the study was Quasi-experimental (pre-test-post-test control group) design.

The research design is as follows:

	Pre-test	**Treatment**		**Post-test**			
Group I	$O_{1.1}$	--	--	$O_{1.2}$	$O_{1.3}$	$O_{1.4}$	$O_{1.5}$
Group II	$O_{2.1}$	X_1	Ob_1	$O_{2.2}$	$O_{2.3}$	$O_{2.4}$	$O_{2.5}$
Group III	$O_{3.1}$	X_2	Ob_2	$O_{3.2}$	$O_{3.3}$	$O_{3.4}$	$O_{3.5}$

$O_{1.1} – O_{1.5}$ Assessment of the temperature before the intervention, and after the intervention at 15th, 30th, 45th and 60th minute in Group I

$O_{2.1}$ -$O_{2.5}$ Assessment of the temperature before the intervention, and after the intervention at 15th, 30th, 45th and 60th minute in Group II

$O_{3.1}$ -$O_{3.5}$ Assessment of the temperature before the intervention, and after the intervention at 15th, 30th, 45th and

60^{th} minute in Group III

X_1 Sponging with cold water

X_2 Sponging with warm water

Ob_1 Observation of behavioural response using an observational during sponging in Group II

Ob_2 Observation of behavioural response using an observational during sponging in Group III

Group I (control group): The control group consisted of 20 pyrexic children with hyperthermia receiving routine treatment. Routine care consists of medication with syrup paracetamol 5 mg/kg/day, parental support, good ventilation and unwrapping of the child.

Group II (experimental group): This group consist of 20 pyrexic children with hyperthermia subjected to cold water sponging along with routine treatment for fever.

Group III (experimental group): This group consist of 20 pyrexic children with hyperthermia subjected to warm water sponging along with routine treatment for fever.

Population: Pyrexic children with rise in body temperature(100-102.8^0F).
Sample: Pyrexic children (60) with viral fever selected by purposive sampling.
Variables:

- Independent variable: Routine treatment, warm water sponging, cold water sponging
- Dependent variable: Temperature, behavioural response of children during sponging
- Attribute variable: Age of the child, gender, the day of intervention during present hospitalization, educational status of the parents, occupational status of the parents, relationship of the child with the caregiver, previous hospitalization with fever

Setting of the study: The study was conducted at Father Muller Medical College Hospital, Mangalore which is a 1050-bed multi-speciality teaching hospital. It has a well-established paediatric ward with 75 beds including a 20-bed NICU. On an average 200 children get admitted every month for paediatric care. Children with medical and surgical problems are treated and this hospital is well-known for its nursing care. It also conducts educational programmes such as paramedical courses.

Sampling criteria

- Inclusion criteria

1. Hospitalised pyrexic children with an elevated body temperature of 100-102.8°F.
2. Children diagnosed exclusively with viral fever.
3. Children in the age group of 1-6 years.
4. Children receiving only antipyretics and no other interventions for temperature decline.
5. Children cooperating during the procedure,

- Exclusion criteria

1. Children with a history of febrile convulsion.
2. Unconscious or seriously sick children.

Data collection instrument

Data collection tools are the procedures or instruments used by the researcher to observe or measure the key variables in the research problem. The data was collected using the following tools:

- Tool 1: Baseline proforma
- Tool II: Assessment of temperature
- Tool III: Behavioural response observational checklist for children during sponging

Content validity

The validation of the tool was done by a self-developed checklist with criteria like agree, disagree, remarks and suggestions. The accuracy, relevance and appropriateness of the content were refined. The tool was submitted to 13 experts from department of paediatrics in the medical college and nursing with specialization in paediatric nursing. Experts were asked to give their opinion and suggestions about the content of the tools. There was 100% agreement on the content area of the tool. Suggestions were given by the experts to change certain terminologies into simpler forms. Modifications were done as per their advice.

Reliability of the tool

The tools were tested on pyrexic children in the paediatric ward of Father Muller Medical College Hospital Mangalore. Inter-rater reliability was used to find out the reliability of the behavioural observational checklist. The correlation was computed using Karl Pearson's coefficient of correlation formula. The tool was found reliable with a score of 0.89. The reliability of thermometers was checked with other similar thermometers. The readings matched with comparative device used for reliability testing.

Description of the final tool: The final tool consisted of

- Tool I: Baseline proforma
- Tool II: Measures of temperature. It consists of 5 observations of temperature -before intervention, at $15^{th,}$ 30^{th}, 45^{th} and 60^{th} (1h) minutes after intervention.
- Tool III: Structured observation checklist on behavioural response. This tool comprised of 27 items with maximum score of 27. The level of discomfort was rated by higher scores.

Pilot study

The pilot study was conducted in the paediatric ward of Father Muller Medical College Hospital from 25^{th} July to 10^{th} august 2006. The investigator obtained written permission from the concerned authority prior to the study. The study was conducted on eight pyrexic children with four receiving cold water sponging and the other four receiving warm water sponging. Descriptive and inferential statistics was used in the analysis of the data. The results revealed that there was reduction of body temperature for 30 minute and sudden rise of body temperature followed by both types of sponging. The investigator then decided to add a control group who would receive only routine care with antipyretic treatment for the more confirmed findings of the intervention. Thus the final intervention was planned on three groups, namely:

Group I: Routine care (control group)

Group II: Routine care and cold-water sponging (experimental group)

Group III: Routine care and warm water sponging (experimental group)

The tool was found feasible and practicable. No further changes were made to the tool after the pilot study. The investigator then proceeded to the main study.

Data collection process

Data was collected from 15th august to 18th September 2006 in the inpatient paediatric unit of Father Muller Medical Hospital Mangalore. The investigator obtained written permission from the administrator of the hospital prior to data collection. Paediatricians were informed of the purpose of the study for their cooperation. The purpose of the study was explained to the subjects and their caregivers, and written consent was obtained; confidentiality was assured to the sample. Pre-test was conducted on all the groups by checking the temperature. Group II was subjected to cold water sponging and Group III was subjected to warm water sponging after administering the prescribed syrup paracetamol (antipyretic) to reduce the body temperature. Group 1 was given only the prescribed syrup paracetamol. The behaviour of the children was assessed during

sponging with an observational checklist. Post-test was performed by observing the temperature for one hour at intervals of 15 minutes four times to detect the changes. At the end of the data collection, the subjects and their families were thanked.

Plan for data analysis

The data obtained would be analysed using both descriptive and inferential statistics on the basis of objectives and hypotheses of the study. To compute the data a master data sheet was prepared by the investigator to organise and compute the data (Annexure 14). Baseline proforma containing sample characteristics would be analysed using frequency and percentage. The temperature of the child is described using range, frequency, mean, standard deviation and percentage. The significant difference between the mean body temperature of children at various time intervals would be compared by ANOVA and Tukey HSD. The behavioural response of children would be compared by unpaired 't' test.

III Results

Hypotheses:

$H_{1:}$ There will be significant difference in the reduction of pyrexia of Group I and Group II at 0.05 level of significance.

H_2: There will be significant difference in the reduction of pyrexia of Group I and Group III at 0.05 level of significance.

H_3: There will be significant difference in the reduction of pyrexia of Group II and Group III at 0.05 level of significance.

H_4: There will be significant difference between behavioural response of children among Group II and Group III at 0.05 level of significance.

H_5: There will be significant difference in the reduction of pyrexia among Group 1 Group II and Group III at 0.05 level of significance.

Table 1: Comparison of mean, standard deviation and F value of all 3 groups at different time intervals

	Group I		Group II		Group III		
Time of observation	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**F Value**
Before intervention	100.72	0.06	101.52	0.75	100.20	0.75	6.421*
15th minute	100.84	0.69	99.29	0.91	99.67	0.88	13.644*
30th minute	100.72	0.82	100.03	0.84	99.39	0.66	14.572
45th minute	99.71	0.91	99.76	0.82	99.21	0.58	8.040*
60th minute	99.03	0.62	99.72	0.67	99.03	0.62	5.174*

$F_{(1,59)} = 3.15$, $P<0.05$ *

Significant

The data in the above table reveals the significant difference among group I, group II, and Group III in all observation intervals.Mean of group I is higher than group II and group III and the least mean value found in group III.

Hence, Research Hypothesis is accepted and Null Hypothesis is rejected.

Table 2: Comparison of Behavioural responses of group II and group III

Group	Mean score	Standard deviation	Mean difference	't' value
Group II	9.80	3.45	4.55	4.158
Group III	5.25	3.40		

Maximum score= 27; $t_{(38)} = 2.4$

The data presented in table 2 shows that the mean behavioural response score of groups III (5.25) is less than that of group II (9.80). The unpaired 't' test (t= 4.158, P<0.05) highlights the significant difference between the 2 groups which is suggestive of some positive effect in warm sponging compared with cold sponging. Thus, the Null Hypothesis is rejected, and the Research Hypothesis is accepted.

IV Discussion

Comparison of reduction of body temperature in Group 1, Group II and Group III:

ANOVA shows that there was significant difference among Group I, Group II and Group III in all observations ($F_{(1,59)}$ =3.15, P > 0.05). Mean temperature of Group 1 was higher than that of Group II and Group III, and the least mean value was found in Group III at 15th, 30th, 45th and 60th minute. This shows that warm water sponging is more effective in the reduction of body temperature than cold water sponging and antipyretics alone. Mean reduction at 60th minute was higher in Group III (2.17°F) than Group II (1.8°F) and Group I (1.69^{0}F)

Comparison of behavioural responses of Group II and Group III

The present study showed that children in Group II exhibited higher level of discomfort than Group III ($\bar{x}$ = 5.25) The unpaired 't' test (t = 4.158, P ≤ 0.005) highlights the significant difference between Group II and Group III. It shows that children subjected to warm water sponging exhibited reduced level of discomfort than those subjected to cold water sponging.

The study is supported by a randomised controlled trial which revealed that discomfort was exhibited by 22% in the group that received drug and sponge, and 66% in the group that received sponge alone.

V Conclusion

This study attempted to compare the effectiveness a non-pharmacological warm and cold water sponging - in reduction of fever. The following conclusions were drawn based on the findings of the present study:

1. Children who received warm and cold water sponging showed significant difference in the reduction of body temperature from 15th minute.

2. Children who were subjected to cold water sponging showed a rise in temperature at 30th minute in comparison with observation at 15th minute after intervention.

3. Children who received antipyretics alone showed significant reduction in body temperature at 45th and 60th minute after intervention.

4. Cold water sponging was found to be more effective at 15th and 30th minute than antipyretics alone, however, antipyretic was found to be more effective at 45th and 60th minute than cold water sponging.

5. Warm water sponging was more effective in the reduction of body temperature than antipyretics alone in all observations after the intervention.

6 Warm water sponging was more effective than cold water sponging in the reduction of body temperature.

7. Warm water sponging was more effective than cold water sponging or antipyretics alone in all observations after the intervention.

8 Children who received cold water sponging showed more discomfort than those received warm water sponging.

9. Sponging with warm water was more comfortable than cold water sponging.

10. Cold and warm water sponging have immediate action in the reduction of body temperature than antipyretics alone.

11. Warm water sponging was found to be more effective in terms of reduction of body temperature and comfort than warm water sponging.

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