INJNS (39)1 (2026) 1- ١٨

Iraqi National Journal of Nursing Specialties

Journal homepage: https://injns.uobaghdad.edu.iq/index.php/INJNS

Research Article Open Access

Effect of Warm Water Foot Immersion Therapy on Physiological Parameters Regulation among Febrile Children: An Evidence-Based Nursing Intervention

Eitidal Nassir Hussain, MSc.*; Zahid Jasim Mohammed, Ph.D.**.
* Assist lecture, Pediatric Nursing Department, College of Nursing, University of Karbala, Karbala.
Email: ietedal.nasser1204a@conursing.uobaghdad.edu.iq
**Professor, Basic Sciences Department, College of Nursing, University of Baghdad, Iraq.
Email: dr.zahid@conursing.uobaghdad.edu.iq **DOI:** https://doi.org/10.58897/q4994v85

ARTICLE INFO

Article History:
Received: 16/12/2025
Accepted: 04/04/2026
Published: 30/06/2026

Keywords:

Warm Water Foot Immersion Therapy,
Physiological Parameters;
Febrile Children;
Evidence Based Nursing Intervention,
Nursing.

ABSTRACT

Objective(s): To determine the effects of warm water foot immersion therapy on physiological parameters of children with fever.
Methods: A quasi-experimental study carried out at the emergency department of Karbala Teaching Hospital for Children, Karbala, Iraq, from 25th May 2025 to 30th September 2025. A non-probability purposive sample composed of 120 children, their age ranged from 2-7 years allocated into two groups: the intervention group (n=60), who received warm water foot immersion therapy for 15 minutes along with routine care and the control group (n=60), who received routine care only. A structured questionnaire format was used to collect data to assess the physiological parameters before and after the intervention. Data was analyzed using SPSS version 26 by descriptive statistics and Mann-Whitney u test were used in the comparison of groups.
Results: At pre-test, there were no significant differences between the intervention and control groups regarding physiological parameters (body temperature, heart rate, respiratory rate, and oxygen saturation) ensuring group homogeneity. Post-intervention comparison showed a significant reduction in body temperature (p=0.001) and significant improvement in heart rate, respiratory rate, and oxygen saturation level (p=0.001) in the intervention group compared to the control group. Progressive improvements in all selected physiological parameters were observed across the one hours of evaluation.
Conclusion: Warm water foot immersion therapy demonstrated significant beneficial effect on the body temperature, heart rate, respiratory rate, and oxygen saturation in febrile children.
Recommendations: Healthcare providers, particularly nurses should receive training on how to effectively use non- pharmacological methods like WWFI to regulate physiological parameters of febrile children

*Corresponding author: Assist lecture, Pediatric Nursing Department, College of Nursing, University of Karbala, (E. N. Hussain), **Email**: ietedal.nasser1204a@conursing.uobaghdad.edu.iq **ORCID**: https://orcid.org/0009-0003-9662-3738

تأثير العلاج بغمر القدمين بالماء الدافئ على تنظيم المؤشرات الفسيولوجية للأطفال المصابين بالحمى: تدخل تمريضي قائم على الأدلة

المستخلص

الأهداف: تهدف هذه الدراسة إلى تحديد تأثير العلاج بغمر القدم بالماء الدافئ على المؤشرات الفسيولوجية للأطفال المصابين بالحمى ولتحديد العلاقة والاختلافات بين البيانات الديموغرافية والسريرية مع المؤشرات الفسيولوجية بعد انتهاء التجربة.

منهجية البحث: أُجريت دراسة شبه تجريبية في قسم الطوارئ بمستشفى كربلاء التعليمي للأطفال، كربلاء، العراق خلال الفترة من ٢٥ آيار٢٠٢٥ إلى ٣٠ أيلول ٢٠٢٥. تم اختيار عينة هادفة غير احتمالية مكونة من ١٢٠ طفلاً تتراوح أعمارهم بين (٢-٧) سنوات، وقُسِّموا إلى مجموعتين: المجموعة التجريبية (عدد= ٦٠)، التي تلقت علاجاً بغمر القدمين بالماء الدافئ لمدة ١٥ دقيقة بالإضافة إلى الرعاية الروتينية، والمجموعة الضابطة (عدد=٦٠)، التي تلقت الرعاية الروتينية فقط. تم استخدام استبانة مبنية لجمع البيانات مكونة من جزئيين، يتعلق الجزء الأول بالبيانات الديموغرافية والسريرية للطفل، ويتعلق الجزء الثاني بورقة متابعة المؤشرات الفسيولوجية التي استخدمت لتقييم المؤشرات الفيسيولوجية قبل وبعد التدخل، جُمعت البيانات من خلال الملاحظة المباشرة، وتم تحليل البيانات باستخدام SPSS الإصدار ٢٦, حيث تم استخدام الإحصاءات الوصفية واختبار مان ويتني في مقارنة المجموعات.

النتائج: في القياس القبلي، لم تُسجَّل فروق ذات دلالة إحصائية بين مجموعتي التدخل والضابطة فيما يتعلق بالمؤشرات الفسيولوجية قبل التدخل (درجة حرارة الجسم، معدل ضربات القلب، ومعدل التنفس، وتشبع الأكسجين)، مما يدل على تجانس المجموعتين. أما في القياس البعدي، فقد أظهرت المقارنة انخفاضًا ملحوظًا في درجة حرارة الجسم (p=0.001) وتحسنًا ملحوظًا في معدل ضربات القلب ومعدل التنفس ومستوى تشبع الأكسجين (p=0.001) في المجموعة التي خضعت للتدخل مقارنةً بالمجموعة الضابطة. ولوحظ تحسن تدريجي في جميع المؤشرات الفسيولوجية المختارة خلال ساعة من التقييم.

الاستنتاج: أظهر العلاج بغمر القدمين بالماء الدافئ تأثيرًا مفيدًا كبيرًا على درجة حرارة الجسم ومعدل ضربات القلب ومعدل التنفس ومستوى تشبع الأكسجين لدى الأطفال المصابين بالحمى.

التوصيات: على مقدمي الرعاية الصحية، وخاصة الممرضين تلقي تدريب حول كيفية استخدام الطرق غير الدوائية بشكل فعال مثل العلاج بغمر القدمين بالماء الدافئ لتنظيم المؤشرات الفيسيولوجية للأطفال المصابين بالحمى. بالإضافة إلى ذلك أوصى الباحثون بتثقيف الآباء بأن هذا التدخل آمن وسهل ويمكن تطبيقه في المنزل.

الكلمات المفتاحية: العلاج بغمر القدمين بالماء الدافئ، المؤشرات الفسيولوجية، الأطفال المصابون بالحمى، تداخل تمريضي قائم على الأدلة.

Introduction

Fever is defined as the condition at which the body's temperature is raised above normal temperature due to fluctuations in the temperature regulator in the hypothalamus. The condition is the natural body's response to various stimuli, including infections or other stresses [1, 2].

Often the individual feels warm once the temperature goes up and the cellular metabolism, oxygen consumption, heart rate (HR), and respiratory rate (RR) increases to meet the metabolic needs of the body [٣]. Additionally, when body temperature (Temp) increases, HR should increase by roughly 10 beats per minute (bpm) for every degree Celsius (°C). For instance, an observational study of 60,000 children assessed in the emergency department (ED) revealed that a 10 bpm increase in HR was linked to a 1 °C rise in body temperature [٤]. The same study also discovered a modest positive correlation between Temp and RR, with an increase in body temperature of 1 °C being associated with an increase in RR of roughly 1.3 breath per minute (bpm) [٥, ٤].

Childhood fever remains a very significant health issue among parents. A wide range of childhood illnesses is accompanied by fever, leading to varied attempts at treatment by parents at home before reaching to hospitals [٦]. Nearly 65% of pediatric ambulatory visits are thought to be cause by fever making feverish illness extremely frequent among especially young children as 20% and 40% of parents report that their children have a fever every year.

Consequently, childhood fever is the second most common cause of hospital admission for children [٧, ٨]. In contrast, parents typically viewed fever as a disease rather than a sign of illness. As a result, they may feel anxious and make a lot of phone calls and visits to the outpatient clinic, that may lead to perform unnecessary diagnostic tests and administer unnecessary medication to their children merely to reduce their own anxiety [٩].

There are various interventions have emerged to treat fever. This can be possible either by pharmacological methods or physical methods (nursing intervention). Pharmacological based methods involving the administration of antipyretic therapy such as acetaminophen (paracetamol), is the first option to subside the fever in human, act by inhibiting prostaglandin synthesis which eventually improve the peripheral vasodilation with attendant heat loss as well as resetting the hypothalamus (thermoregulatory center) to normal [١٠, ١١]. Numerous studies have shown that a significant number of parents, guardians, or caregivers administer antipyretics to children even when the fever is mild or absent, often using incorrect dosages or not allowing adequate time between doses [١٢].

Along with pharmacological approaches, there are different physical measures suggested to manage fever in pediatric population and widely used among parents and health care professionals that including warm compresses, tepid sponging, external cooling and warm water foot immersion therapy [١٣]. Warm water foot immersion (WWFI) therapy is a local immersion bath that covers the feet and ankles with water in temperature range from 90° - 110°F. WWFI therapy improves blood circulation and dilates blood vessels, which helps the body eliminate toxins by provide brain cells with oxygen and releasing heat through perspiration [١٤].

When WWFI therapy is applied for 15 to 20 minutes, the blood vessels in the foot start to expand and receive enhanced points by heat transfer from a higher heat area to a lower heat area. The improved blood circulation resets the hypothalamic set. Applying warm water to the foot allows the congested blood to flow towards distant parts of the body and is brought to the dilated vessels of the foot and leg [١٥].

pediatric nurse plays a pivotal role in implementing complementary therapies and educating families about safe, effective interventions [١٦]. Nonetheless, nurses are considered as a vital member of the multidisciplinary team who have the responsibility support those who require medical attention. The needs for nurses with specialized skills to effectively satisfy the community's health needs has increased due to changes in the disease structure, birthrate, and mortality rate [١٧]. An important nursing action in fever management are temperature measurement, documentation, and administration of antipyretic medications which also considered as an integral aspect of the pediatric nurses role in the heath setting [١٨].

The ongoing advancement that occurs in various fields around the world, especially in healthcare sector required from healthcare providers to have a wide range of knowledge, skills, and critical thinking in order to preserve people's health throughout their lives [١٩, ٢٠]. Healthcare providers are recommended to use alternative therapy which are considered as safe, side -effect- free, cost effective, not dependent on medication and easy to administered [٢١]. Therefore, establishing a robust evidence base for WWFI therapy efficacy in regulating febrile children's physiological parameters is essential for informing clinical practice and improving child outcomes.

Research Question: Is the WWFI therapy regulate the physiological parameters of febrile children?

Methods

Study Design and Setting

A quasi-experimental study was conducted at emergency department (ED) of Karbala Teaching Hospital for Children which is the only governmental pediatric hospital in Karbala Governorate. The study extended from May 25th, 2025 to September 30th, 2025.

Study Sample and Sampling

A non-probability purposive sample consist of 120 children presented with fever admitted to the ED, they allocated into two groups (60) in each group. Children whose axillary body temperature more than 37.5c0 aged between 2-7 years old, Take intravenous antipyretics (paracetamol), and cooperative child and/or his/her family. Children have abnormal skin conditions like burns, ulcer, lesion, open wounds, abscess or boils on their feet, have mental disorder, have anaphylaxis reaction, As well as, child how fear or cry continuously during follow up for physiological parameters by the researcher.

Sample Size

The minimum sample size for this study was 120 participants according to the calculation of the minimal sample size based on a confidence level of 95% and margin of error of 0.05 [٢٢]. They were assigned to either the intervention group (n=60) or control group (n=60) to verify the physiological differences between groups which are clinically meaningful as shown in (Figure. 1).

Study Instruments

The researchers used the relevant literature to develop a structured questionnaire format that derived from the previous studies that apply foot bath therapy to regulate physiological parameters [٢٣,٢٤]. The final copy of the study instrument was designed in the English language and consists of the following two parts: socio-demographic and clinical data part including the essential descriptive data of the participants in the study. These data included (sex, age, type and duration of fever, associated symptoms with fever, and previous hospitalization). The physiological parameters follow up sheet was used before and after application of WWFI therapy to measure the child's body Temp, HR, RR, and SpO2.

Data Collection and Intervention

The researcher collects the data by direct observation and with assistance of the co-observer. The parameters were measured by the same tool at the same time on the same participant. The consented to participate in the study was obtained after being thoroughly examined and diagnosis to have fever by the health care provider (nurse) and insurance by the researcher.

During a pre-test period, baseline data were collected from participants by using a questionnaire of demographic characteristic and clinical data, and the physiological parameters sheet to measure physiological parameters to record as (pretest) for both groups.

Subjects in the interventional group (n=60) received WWFI therapy for ١٥ minutes along with routine care by placed in a sitting position either by themselves or with assistant from parents and his/her feet involving ankles was submerged in the foot bath. The child was fully covered with a blanket or sheet, with the exception of their head and neck, and the water temperature was adjusted with a bath thermometer to 38-40 c0. Axillary body temp, HR, SPO2, and RR was measured after applying the intervention at 15,30, 45, and 60min by mercury thermometer, pulse oximeter, and RR measured by inspection to the chest movement for one full min to recorded as (post-test).

In contrast, subjects in the control group (n=60) received routine care only to reduce temperature in the hospital like

antipyretic drugs. The researcher did not provide any intervention to the subjects; instead, they received pre-test and post- test assessments for body temp, HR, SPO2, and RR every 15min by using the same tools used for interventional group.

Ethical Considerations

The study protocol received approval from the Committee of Scientific Research Ethics at the College of Nursing, University of Baghdad, Iraq. Additional authorization was obtained from the Karbala Teaching Hospital for Children and all participants' parents provided written informed consent following a thorough explanation of the study's objectives, methods, potential risks, and benefits.

Statistical Data Analysis

Data analysis is a crucial step in nursing research, when a variety of statistical methods are used to describe and evaluate the collected information. The Statistical Package for Social Sciences (SPSS) version 26 was utilized to analyzed data. Descriptive statistics including number, percentages, means, and standard deviations were calculated for demographic variables. The homogeneity of variation for demographic traits across groups was evaluated using Levene's test, given the non-normal distribution of physiological parameters, the non-parametric Mann-Whitney U test was employed to compare differences between intervention and control groups at pre-test and post-test measurements.

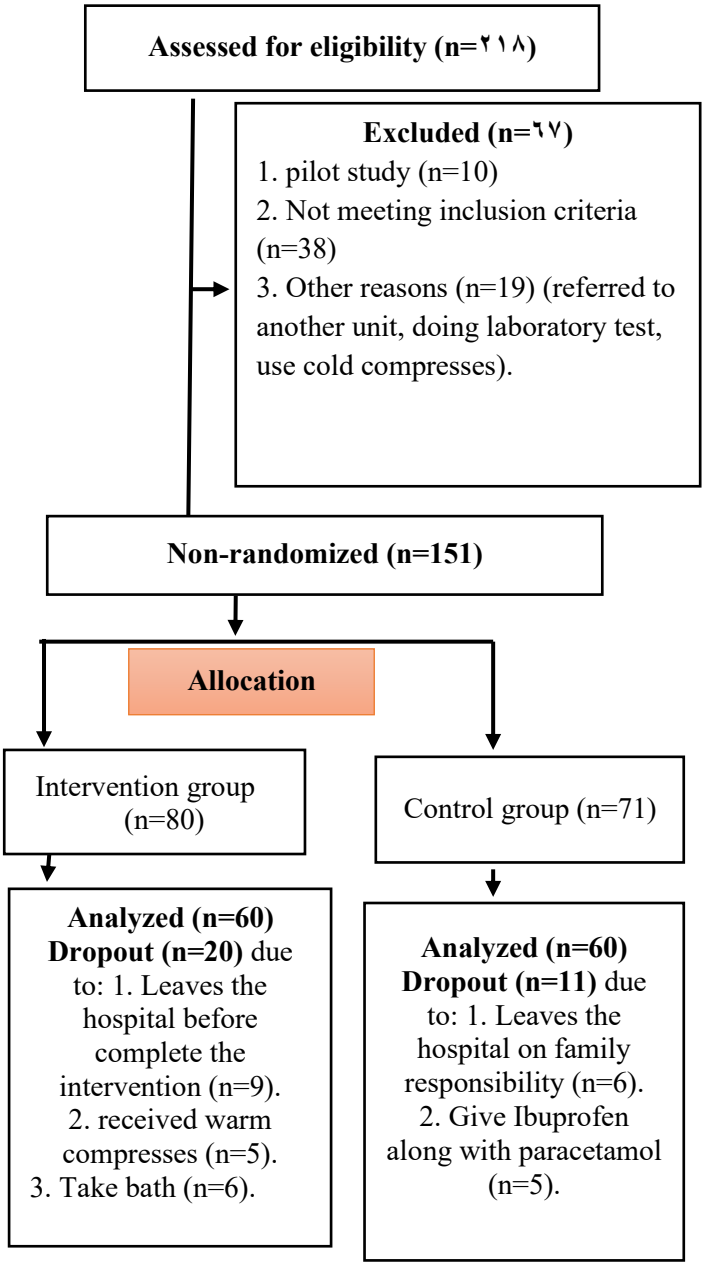

Figure 1. Flowchart of sample distribution

Results

Table 1. Socio-demographic and clinical data of Participants (No.= 100)

List	Characteristics in each group		Control group		WWFI group	
			F.	%	F.	%
1	**Age (year)**	2 – less than 4	7	11.7	14	23.3
		4 – less than 6	26	43.3	16	26.7
		≥ 6	27	45	30	50
		M±SD	***4.5 ± 1.5***		***4.6 ± 1.7***	
2	**Sex**	Male	37	61.7	35	58.3
		Female	23	38.3	25	41.7
3	**Type of fever**	Intermittent	39	65	35	58.3
		Continuous	21	35	25	41.7
4	**Fever duration**	Last night	13	21.7	17	28.3
		1 – 2 days	26	43.3	23	38.3
		3 – 4 days	14	23.3	13	21.7
		5 days or more	7	11.7	7	11.7
5	**Associated symptoms with fever**	Vomiting	14	23.3	17	28.3
		Convulsion	15	25	13	21.7
		Uncomfortable/ tired	24	40	24	40
		Combination	7	11.7	6	10
6	**Previous hospitalization**	yes	48	80	39	65
		No	12	20	21	35

F= Frequency, **%**= Percentage, **M**= Mean, **SD**= Standard deviation

Table 1 indicates that most of participants in control and WWFI therapy groups were within the age group (≥ 6) years old and accounted 43.3%, 50%respectively. Males represent a clear majority in each group and accounted 61.7%, 58.3% respectively. Regarding the types of fever, the intermittent is more commonly observed than continuous fever in the experimental and control groups and accounted 65% & 58.3%, for control and WWFI therapy groups respectively. In concern to the duration of fever 43.3% of participants in the control group & 38.3% in the WWFI therapy group, group have fever for 1-2 days. The associated symptoms report that feeling uncomfortable or tired is the most reported symptom across each group and accounted 40% & 40% respectively. Vomiting and convulsions are less common, and combinations even rarer. This table also exposed that there's a notable disparity: 80% of children in the control group had prior hospital admissions, compared to 65% in the WWFI therapy group.

Table 2. Significant differences in physiological parameters across time points in control group

Parameters	Times Points	Descriptive Statistics				Friedman Test				
		M	SD	Min	Max	Mean Rank	χ^2	df	p-value	Effect size*
Temp	Pre-intervention	38.912	.5256	37.9	40.2	3.12	6.842	4	.145	.03
	Post (15 min)	38.825	.5395	37.6	40.0	3.08				
	Post (30 min)	38.543	.5027	37.4	39.7	2.95				
	Post (45 min)	38.362	.5178	37.4	39.5	2.90				
	Post (60 min)	38.167	.5007	37.2	39.5	2.95				
	Pre- intervention	131.20	17.778	80	167	3.15	5.732	4	.220	.02

HR	Post (15 min)	127.65	18.311	77	166	3.05				
	Post (30 min)	126.67	15.667	84	163	3.00				
	Post (45 min)	124.28	15.214	85	154	2.95				
	Post (60 min)	120.57	15.383	79	147	2.85				
RR	Pre- intervention	35.52	5.147	24	52	3.20	4.826	4	.305	.02
	Post (15 min)	34.13	5.488	24	52	3.10				
	Post (30 min)	31.95	5.528	24	51	3.05				
	Post (45 min)	30.40	5.811	22	51	2.95				
	Post (60 min)	28.48	5.721	21	46	2.70				
SPO2	Pre- intervention	94.75	1.385	91	98	3.05	6.132	4	.189	.03
	Post (15 min)	95.53	1.255	92	99	3.00				
	Post (30 min)	95.80	1.190	91	99	2.95				
	Post (45 min)	96.03	1.089	93	99	3.05				
	Post (60 min)	96.12	1.027	93	99	2.95				

M= Mean of total score, **SD**= Standard deviation, **Min**= Minimum, **Max**= maximum, **χ^2**= Chi-square, **df**= Degree of Freedom, **P**= probability, * Kendall's W

Table 2 Focusing on the significant changes in physiological parameters across the repeated time points within control group; body temperature shows only a modest decline over time, starting at a mean of 38.91 ± 0.53 °C and gently decreasing to 38.17 ± 0.50 °C by 60 minutes. The Friedman test revealed no statistically significant change in temperature across time points (χ^2 = 6.84, df = 4, p = .145), accompanied by a very small effect size of .03, mean HR decreased gradually from 131.2 ± 17.8 bpm at baseline to 120.6 ± 15.4 bpm at 60 minutes. However, the Friedman test indicated this change was not statistically significant (χ^2 = 5.73, df = 4, p = .220), accompanied by a very small effect size (W = .02), RR exhibited a gradual decline from a mean of 35.52 ± 5.15 breaths/min at baseline to 28.48 ± 5.72 breaths/min after 60 minutes. However, the Friedman test indicated no statistically significant change over time (χ^2 = 4.83, df = 4, p = .305), with a very small effect size (W = .02), and mean SPO2 rose modestly from 94.75 ± 1.39% at baseline to 96.12 ± 1.03% by 60 minutes. However, the Friedman test showed no statistically significant change across time points (χ^2 = 6.13, df = 4, p = .189), with a negligible effect size (W = .03).

Table 3. Significant differences in physiological parameters across time points in the WWFI therapy group

Parameters	**Times Points**	**Descriptive Statistics**				**Friedman Test**				
		M	**SD**	**Min**	**Max**	**Mean Rank**	**χ^2**	**df**	**p-value**	**Effect size***
Temp	Pre- intervention	38.882	.4184	38.3	39.8	4.91	231.082	4	.001	.96
	Post (15 min)	38.612	.4809	37.5	39.8	4.08				
	Post (30 min)	37.837	.4961	37.0	39.0	2.90				
	Post (45 min)	37.380	.4297	36.2	38.8	2.00				
	Post (60 min)	36.847	1.3234	27.2	37.8	1.11				
HR	Pre- intervention	132.98	17.558	77	166	4.90	221.118	4	.001	.92
	Post (15 min)	124.70	18.443	73	155	3.97				

	Post (30 min)	116.22	18.340	70	158	2.98				
	Post (45 min)	108.13	17.010	70	142	2.11				
	Post (60 min)	98.77	16.213	65	130	1.04				
RR	Pre- intervention	35.22	3.756	25	44	4.94	233.701	4	.001	.97
	Post (15 min)	31.87	3.717	24	41	4.02				
	Post (30 min)	26.93	3.389	20	38	3.02				
	Post (45 min)	23.22	2.935	19	35	1.98				
	Post (60 min)	20.27	2.378	16	30	1.04				
SPO2	Pre- intervention	95.58	1.807	91	99	1.23	174.574	4	.001	.73
	Post (15 min)	97.17	1.181	95	99	2.31				
	Post (30 min)	98.17	.960	96	100	3.48				
	Post (45 min)	98.42	.850	97	100	3.89				
	Post (60 min)	98.57	.745	97	100	1.09				

M= Mean of total score, **SD**= Standard deviation, **Min**= Minimum, **Max**= maximum, **χ^2**= Chi-square, **df**= Degree of Freedom, **P**= probability, * Kendall's W

Table 3 focusing on the significant changes in physiological parameters across the repeated time points within study group (WWFI therapy); produced a dramatic and statistically significant reduction in mean body temperature from 38.88 ± 0.42 °C at baseline to 36.85 ± 1.32 °C at the 60 min mark. The Friedman test supported these findings strongly (χ^2 = 231.08, df = 4, p = .001), and the effect size was exceptionally large (W = .96), HR showed a substantial and clinically meaningful drop from 132.98 ± 17.56 bpm pre-intervention to 98.77 ± 16.21 bpm at 60 min. The Friedman test revealed this decrease to be highly significant (χ^2 = 221.12, df = 4, p = .001), with a large effect size (W = .92), RR demonstrated a marked and rapid decline from 35.22 ± 3.76 breaths/min at baseline to 20.27 ± 2.38 breaths/min by 60 min. The Friedman test confirmed these changes were highly significant (χ^2 = 233.70, df = 4, p = .001), with a very large effect size (W = .97), and Likewise SPO2 demonstrated a substantial and statistically significant increase from 95.58 ± 1.81% pre-intervention to 98.57 ± 0.75% at 60 min. The Friedman test confirmed this change was highly significant (χ^2 = 174.57, df = 4, p = .001), with a large effect size (W = .73).

Table 4. Associations and differences between the effect of Warm water foot immersion therapy, on physiological parameters with child's demographic characteristics and clinical data

Association Variables		**Temperature**		**HR**		**RR**		**SpO_2**	
		Mean Rank	**Test result**	**Mean Rank**	**Test result**	**Mean Rank**	**Test result**	**Mean Rank**	**Test result**
Age (year)	2 – less than 4	36.329	r^s = .029 P = .825	109.29	r^s = .425 P = .001*	21.79	r^s = .163 P = .213	98.79	r^s = .055 P = .675
	4– less than 6	37.063		101.94		19.63		98.44	
	≥ 6	36.973		92.17		19.90		98.53	
Sex	Male	36.689	*U*= 362.000	98.14	*U*= 431.500	20.46	*U*= 364.000	98.69	*U*= 354.000
	Female	37.06		99.64		20.0		98.4	

		8	P = .249		P = .928	0	P = .162	0	P = .160
Types of fever	Intermittent	37.031	*U*= 412.000 P = .697	97.43	*U*= 393.500 P = .508	20.09	*U*= 373.500 P = .328	98.51	*U*= 396.000 P = .485
	Continuous	36.588		100.64		20.52		98.64	
Fever duration	Last night	36.524	*H*= 3.337 P = .343	110.06	*H*= 10.104 P = .018*	20.94	*H*= 1.448 P = .694	98.53	*H*= 6.015 P = .111
	1 – 2 days	37.035		96.26		19.91		98.78	
	3 – 4 days	36.985		93.00		20.46		98.15	
	5 days or more	36.757		90.29		19.43		98.71	
Associated symptoms	Vomiting	37.006	*H*= 3.923 P = .270	95.00	*H*= 21.786 P = .001*	19.88	*H*= 1.954 P = .582	98.53	*H*= 1.740 P = .628
	Convulsion	36.454		117.62		21.38		98.54	
	Uncomfortable	36.962		94.21		19.92		98.67	
	Combination	36.783		86.83		20.33		98.33	
Previous hospitalization	Yes	37.013	*U*= 373.000 P = .565	95.41	*U*= 267.000 P = .027*	19.87	*U*= 329.000 P = .204	98.54	*U*= 396.500 P = .821
	No	36.538		105.00		21.00		98.62	

r^s= Spearman Correlation coefficient, **H**= Kruskal–Wallis H, **U**= Mann–Whitney U, **P**= Probability value, *: Significant at p-value < .05

Table 4 show a non-significant statistical association was observing between age and Temp, RR, and SPO_2, only HR shows a statistically significant positive correlation with age ($r^s = .425$, p = .001) among children aged 2 to <4 years. The findings related to sex and types of fever found no significant differences in any of the four physiological parameters after applying WWFI therapy. The duration of fever was significantly associated with HR improvement ($H = 10.104$, p = .018), showing that children with more recent fever onset (last night) displayed greater HR reduction (mean rank 110.06) compared to those with longer duration, whose mean ranks trended downward. However, no significance emerged for Temp, RR, and SPO2. Among associated symptoms, only HR shows a significant difference between symptom groups ($H = 21.786$, p = .001). Specifically, children with convulsions had the highest HR mean rank (117.62), indicating a larger HR reduction post-immersion compared to those with vomiting, discomfort, or a combination of symptoms. A history of hospitalization significantly influenced HR outcomes ($U = 267.00$, p = .027); children without prior hospitalizations had higher HR mean ranks (105.00), implying a better HR response to the intervention than those with past admissions (mean rank 95.41). No significant associations were found for Temp, RR, and SPO2.

Table 5. Associations and differences among demographic characteristics and clinical data and physiological parameters of children with fever in the control group

Association Variables		Temperature		HR		RR		SpO_2	
		Mean Rank	Test result	Mean Rank	Test result	Mean Rank	Test result	Mean Rank	Test result
Age (year)	2 – less than 4	34.90	r^s = .015 P = .911	35.43	r^s = -.202- P = .122	40.10	r^s = -.366- P = **.004***	32.63	r^s = -.245- P = .059
	4– less than 6	26.96		29.96		29.26		33.85	
	≥ 6	31.20		27.70		25.25		25.55	
Sex	Male	32.55	*U*= 349.500 P = .244	28.51	*U*= 352.000 P = .263	30.08	*U*= 410.000 P = .813	29.70	*U*= 396.000 P = .637
	Female	27.20		33.70		31.17		31.78	
Type of fever	Intermittent	28.91	*U*= 347.500 P = .332	31.97	*U*= 352.000 P = .373	29.86	*U*= 384.500 P = .697	32.36	*U*= 337.000 P = .237
	Continuous	33.45		27.76		31.69		27.05	
Fever duration	Last night	30.00	*H*= 10.884 P = **.012***	22.08	*H*= 7.678 P = .053	26.58	*H*= 2.735 P = .434	30.00	*H*= 5.027 P = .170
	1 – 2 days	37.65		37.29		32.85		25.77	
	3 – 4 days	18.89		27.64		26.64		36.86	
	5 days or more	28.07		26.64		36.79		36.29	
Associated symptoms	Vomiting	25.68	*H*= 4.768 P = .190	23.00	*H*= 3.625 P = .305	29.64	*H*= 2.281 P = .516	39.46	*H*= 5.541 P = .136
	Convulsion	35.83		30.93		32.63		29.07	
	Uncomfortable	27.58		33.77		32.23		27.60	
	Combination	38.71		33.36		21.71		25.57	
Previous hospitalization	Yes	27.48	*U*= 143.000 P = **.007***	28.88	*U*= 210.000 P = .149	31.13	*U*= 258.000 P = .578	31.08	*U*= 260.000 P = .586
	No	42.58		37.00		28.00		28.17	

Rs= Spearman Correlation coefficient, **H**= Kruskal–Wallis H, **U**= Mann–Whitney U, **P**= Probability value, *: Significant at p-value < .05.

Table (5): Show a non-significant statistical association was observing between age and Temp, HR, and SPO_2, only RR shows a statistically significant positive correlation with age (rs = -.366-, p = .004) among children aged 2 to <4 years. The findings related to sex, types of fever, and associated symptoms found no significant differences in any of the four physiological parameters. The duration of fever, there were statistical significance differences for Temp (H = 10.884, p = .012). The previous hospitalization refers that were a significant difference identified between prior hospitalization with Temp (U = 143.000, p = .007).

Discussion

This study offers actual evidence supporting the efficacy of WWFI therapy on physiological aspects of febrile children, especially body temp, HR, RR, and oxygen saturation. This evidence contributes to a growing literature supporting non-pharmacological, accompaniment-based interventions in the healthcare settings.

Children socio-demographic and clinical data

The predominant age group in the control and WWFI therapy, is equal or more than 6 years old. Making up 45% and 50% of the participants of the two groups respectively. This pattern implies that children in this age group (school age) are in a growth and development stage and certainly exposed to various disease that may require additional medical attention due to the transmission of infection and they also disregard or forget to wash their hands after using the restroom and to drink enough fluids, this leading to their overrepresentation in the comparison groups. This result was consistent with a cross-sectional study that aim to conduct an evaluation of length of stay (LoS) of all paediatric hospitalizations in children under 16 years. Indicate that the most common age group admitted to the hospital was children younger than 12 years, accounting for 45.6% of total admissions [٢٥]. This finding also consistent with a study carried out in Iraq, which demonstrated that (47.3%) in the control group, and (45.3%), (43.1%) respectively in the both experimental groups was within age group between 6 and 8 years old [26]. While, another retrospective cohort study performed by Isa et al, which was not consistent with our result, found that 31.6% of the study participants between age (3-5) years old [٢٧].

The male child was predominance observed in the both groups and account (61.7%, 58.3%) that aligns with findings of study conducted in sub-Saharan Africa, reported that that boy exposure to episodes of fever and diarrhea more than girls [٢٨]. Also, Rahman and Hossain, who conducted a survey among children aged 6–59 months found that 34.23% of the study participants were male, which was consistent with our study result [٢٩]. Another descriptive correlational study at Dhi-Qar Health Directorate pediatric hospitals, indicate that 64.0% of participants in hospitalization were male and 58.4%. of participants in outpatient group were male also [٣٠]. On other hand, a descriptive study was conducted to assess the efficacy of cold application to reduce pain during chest tube removal. Report that (58.3%) of the participants in the study were female [٣١].

In terms of participants' clinical data, the study findings indicate that the intermittent fever is more commonly observed than continuous fever across groups, with control: 65% and WWFI therapy: 58.3%, the duration of fever reports that the 1-2 days category commands the highest share in each group: control: 43.3% and WWFI therapy: 38.3%, and the associated symptoms reports that feeling uncomfortable or tired is the most reported symptom across groups: control: 40% and WWFI therapy: 40%. vomiting and convulsions are less common, and

combinations even rarer. Additionally, there's a notable disparity: 80% of children in the control group had prior hospital admissions, compared to 65% in the WWFI therapy group. This suggest that fever and other associated symptoms including felling of restlessness, nausea, vomiting, and abdominal pain which was an indicates that the child may have a serious illness that needs to seek medical care for children by their health care givers. These results are in line with Gosalya who demonstrate that the majority of study participants had fever for two days, comprising 40% in the control and experimental groups and 78%,80% had intermittent fever respectively in both groups [٣٢].

The current research findings regarding symptoms associated with fever and history of previous hospitalization, are largely consistent with the results of a quasi-experimental study at Children Hospital affiliated to Ain Shams University. Revealed that majority of children felt uncomfortable/ tired as a symptom that associated with fever. In both the experimental and control groups, over half experienced headaches, nearly one-fourth experienced skin rashes, and over one-third experienced convulsions or seizures. Additionally, the majority of participants in the control and study groups had prior hospital admissions, accounting for 48% and 54%, respectively (٢٣). While another study found that when related symptoms were taken into account, 33.3% of the intervention group experienced vomiting, 10% experienced exhaustion, and 6.7% experienced eye congestion, in contrast 20% of the control group experienced vomiting, 13.3% experienced fatigue, and 6.7% experienced eye congestion [٣٢].

The differences in the selected physiological parameters across time points in the control and study groups (pre-test & post-test)

According to the statistical analysis of physiological parameters for participants in the study and control groups, as showed in table (2,3) indicated that participants in the study group experienced a significant improvement in their selected physiological parameters compared to those in the control group after using the WWFI therapy for 60 min. WWFI therapy produced a dramatic and statistically significant reduction in mean body temperature from 38.88 ± 0.42 °Cat baseline to 36.85 ± 1.32 °C at the 60 min indicating a powerful intervention effect, HR showed a substantial and clinically meaningful drop from 132.98 ± 17.56 bpm pre-intervention to 98.77 ± 16.21 bpm at 60 min this confirms that water immersion is a highly effective method for rapidly reducing tachycardia in febrile children, RR demonstrated a marked and rapid decline from 35.22 ± 3.76 breaths/min at baseline to 20.27 ± 2.38 breaths/min by 60 min this indicates a powerful physiological response, with warm water immersion effectively restoring respiratory patterns into or near normal pediatric ranges quickly, and Likewise SPO2 demonstrated a substantial and statistically significant increase from $95.58 \pm 1.81\%$ pre-intervention to $98.57 \pm 0.75\%$ at 60 min this data highlights the efficacy of warm water immersion in rapidly enhancing oxygenation to within high-normal ranges. Point of view, these results could be explained by the possibility that soaking feet in warm water can affect body temperature, primarily by promoting circulation and vasodilation that increasing blood flow to the extremities and the rest of the body., which helps dissipate heat and can lower body temperature, especially in cases of fever. Also, the therapeutic effect of warm water soaks extends to comfort and relaxation by promoting blood circulation and muscle relaxation, which can be beneficial in

managing fatigue and sleep disturbance that association with fever.

This finding may be explained by the fact that physiological parameters are interdependence with each other. All physiological aspect is affected and improved once the body temp drops. These results are in line with Kandulna who observed that that the average of body temperature in pre-test was 100.9 which reduced to 100.5, 100.3 and 100.2 at 15 min, 30 min and 45 min, the average of HR in pre-test was 100.3 which reduced to 96.1, 93.5 and 93.6 at 15 min, 30 min, and 45 min, and the average of RR in pre-test was 25.1 which reduced to 23.1, 22.3 and 22 at the same previous time interval. It is verified that the hot water foot bath was effective in improving the physiological response of the patients presented with fever (٢٤). Similarly, Mandal et al [٣٤]. show an average decrease in the chosen physiological parameters (body temp, HR, and RR) following the application of a warm foot bath in the experimental group, whereas physiological parameters are markedly elevated in the control group.

The findings of this study resemble the findings of a single blind clinical trial study who report that the mean scores of Temps (37.08 vs. 37.07), HR (86.47 vs. 85.37), RR (19.67 vs. 17. 47) and the amount of SpO2 significantly increased (96.2 vs. 97.67) [٣٥]. These findings provide an indicator that foot baths can be considered as a complementary medicine, safe, inexpensive, and improve physiological parameters effectively.

The associations and differences between the effect of WWFI therapy on selected physiological parameters with child's demographic characteristics and clinical data

Based on the associations and differences between the effect of WWFI therapy on physiological parameters with child's demographic characteristics and clinical data, Table (4) the findings indicate that HR have a positive correlation with age of children within age group (2 to <4 years) that was represented (p- value =0.001<0.05), on other hand, there are non- significant correlation among others physiological parameters. This indicates younger children experienced greater HR reduction post-intervention compared to older groups. As well as there was a significant association between HR improvement and the duration of fever (p-value =0.018<0.05), children with more recent fever onset ("last night") displayed greater HR reduction (mean rank 110.06) compared to those with longer duration, whose mean ranks trended downward. The findings shows that there is a statistical difference between HR and the symptoms associated with fever (p-value =0.001<0.05), children with convulsions had the highest HR mean rank (117.62), indicating a larger HR reduction post-immersion compared to those with vomiting, discomfort, or a combination of symptoms. Additionally, the history of previous hospitalization significantly influenced HR outcomes (p = 0.027<0.05); children without prior hospitalizations had higher HR mean ranks (105.00), implying a better HR response to the intervention than those with past admissions (mean rank 95.41). in contest, the findings related to sex and type of fever found no significant differences in any of the four physiological parameters. This finding contrasts with a previous study performed among children aged (6-12) years report that the was no statistical correlation between the effect of foot bath and demographic variables of participants in the experimental group at p>0.05 [٣٦]. Another study confirms the current study results that indicates that there is no statistical association between the demographic and clinical data of participants like age, sex, fever duration and the effectiveness of foot bath therapy, at p-value

=0.264, 0.502, and 0.445 respectively [٣٧]. Our findings are consistent with a quasi-experimental nonequivalent control group study that was carried out to confirm the impact of using warm foot bath on body temperature. This study declared that the intervention group showed no significant statistical correlation between the child's age, sex, length of fever, and type of fever [٣٢].

Section IV: Discussion of associations and differences among demographic characteristics and clinical data and physiological parameters of children with fever in the control group

Based on the findings in table (5) that indicate that there was a statistically significant positive correlation between RR and age (rs = -.366-, p = .004) among children aged 2 to <4 years, on other hand, there are non-significant correlation among others physiological parameters. As well as, the findings related to sex, types of fever, and associated symptoms indicate that there were no significant differences in any of the four physiological parameters. The duration of fever, there were statistical significance differences for Temp (H = 10.884, p = .012). The previous hospitalization refers that were a significant difference identified between prior hospitalization with Temp (U = 143.000, p = .007). These findings consist with RCT study that found there was a significant correlation between RR and age of children at (p- value = 0.001) [6]. On other hand, another study showed that no association between level of temperature in control group with sex, duration of hospitalization, duration of fever and associated symptoms of fever the p value found to be 1.00, 0.296,0.842, and 0.851 respectively and no significant at the level of 0.05 [38].

Limitations

There were some limitations during the course of the study that affect and interfere with data collection and intervention. The study was conducted at a single institution and the lack of randomization in sampling process, which reflect on the current findings that might not be generalized. As well as, some families declined continued participation. As well as, the novelty of this intervention in the Iraqi healthcare context presented challenges in obtaining institutional approvals and establishing standardized protocols. Despite these challenges, the effective execution of this trial lays the groundwork for further investigation and possible incorporation of WWFI therapy into the standard treatment of children with fever.

Conclusion

The study's finding shows that WWFI therapy significantly affects the regulation of physiological parameters levels. These methods were found to be more effective as supportive care to improve physiological parameters and prevent complications among febrile children when considering as non-pharmacologic interventions.

Recommendations

Healthcare providers, particularly nurses should receive training on how to effectively use non-pharmacological approaches, such as WWFI therapy to managed fever among children. Parents or other family members should be educated that these non- pharmacological interventions can be done at home, as an easy and comfortable method, does not demand any further cost or adverse side effect, and their benefits are great in preventing the progression increased in body temperature and reducing its complication for example: febrile convulsion. Conducting additional studies with a larger sample size and a probability sampling method to establish more accurate generalization.

Acknowledgment

The author would like to thank all involved participants for their participation in this study.

Financial support and sponsorship

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors report no conflicts of interest in this work.

Availability of data and materials

The datasets used during the current study are available from the corresponding author upon reasonable request.

References

1. Ma LL, Liu HM, Luo CH, He YN, Wang F, Huang HZ, Han L, Yang M, Xu RC, Zhang DK. Fever and antipyretic supported by traditional Chinese medicine: a multi-pathway regulation. Frontiers in Pharmacology. 2021 Mar 22;12:583279. https://doi.org/10.3389/fphar.2021.583279
2. Dullius W, Fernandes GL. Non-pharmacological nursing management of pediatric patients with fever and hyperthermia: a systematic review/Manejo não farmacológico da enfermagem em pacientes pediátricos com febre e hipertermia: uma revisão sistemática. Revista de Pesquisa Cuidado é Fundamental Online. 2024 Mar 29;16. doi: 10.9789/2175-5361.rpcfo.v16.13015
3. Muthupriya M, Lakshmi R. Effectiveness of Hot Water Footbath Therapy in Reducing Body Temperature amongst Patients with Fever. Indian Journal of Continuing Nursing Education. 2020 Jul 1;21(2):181-4. doi: 10.4103/IJCN.IJCN_19_20
4. Kirschen GW, Singer DD, Thode Jr HC, Singer AJ. Relationship between body temperature and heart rate in adults and children: A local and national study. The American journal of emergency medicine. 2020 May 1;38(5):929-33. https://doi.org/10.1016/j.ajem.2019.158355
5. Broman ME, Vincent JL, Ronco C, Hansson F, Bell M. The relationship between heart rate and body temperature in critically ill patients. Critical Care Medicine. 2021 Mar 1;49(3):e327-31. doi: 10.1097/CCM.0000000000004807
6. Priya DS, Priya BL, K Babu A, Rajakumar PG, Rathinasamy M. Effectiveness of tepid sponging along with antipyretic drug versus only antipyretic drug in the management of fever among children–A randomized control trial. Asian Journal of Pediatric Research. 2023 Feb 9;11(2):6-16. https://doi.org/10.9734/ajpr/2023/v11i2215
7. Castellano VE, Talamona N, Giglio ND, Sabbaj L, Gentile Á. Knowledge and management of fever in parents of children under 5 years of age at a children's hospital. Arch Argent Pediatr. 2020 Apr 1;118(2):89-94. http://dx.doi.org/10.5546/aap.2020.eng.89
8. Elseady GM, Khalifa MI, Okby OM, Fayed NM. Effect of an Evidence Based Protocol for Childhood Fever Management on Quality of Care Provided by Nurses. Menoufia Nursing Journal. 2021 May 1;6(1):147-56. doi: 10.21608/menj.2021.187192
9. Alomari OE, Alyahya O, ALYAHYA OA. Parents' Attitude Towards Their Feverish Children in Buraydah, Saudi Arabia. Cureus. 2024 May 24;16(5). doi: 10.7759/cureus.61000
10. Green C, Krafft H, Guyatt G, Martin D. Symptomatic fever management in children: a systematic review of national and international guidelines. PloS one. 2021 Jun

17;16(6):e0245815. https://doi.org/10.1371/journal.pone.0245815

11. Akyirem S, Bossman IF. Is tepid sponging more effective than paracetamol at relieving fever in febrile children in hot tropical climates? a mini review. Ghana Medical Journal. 2021 Mar 31;55(1):60-8. doi: 10.4314/gmj.v55i1.9
12. Lubrano R, Paoli S, Bonci M, Di Ruzza L, Cecchetti C, Falsaperla R, Pavone P, Matin N, Vitaliti G, Gentile I. Acetaminophen administration in pediatric age: an observational prospective cross-sectional study. Italian journal of pediatrics. 2016 Feb 26;42(1):20. https://doi.org/10.1186/s13052-016-0219-x
13. Villarejo-Rodríguez MG, Rodríguez-Martín B. Parental approach to the management of childhood fever: differences between health professional and non-health professional parents. International journal of environmental research and public health. 2019 Oct;16(20):4014. https://doi.org/10.3390/ijerph16204014
14. Vijayalaxmi V, Ullas A. Effectiveness of warm water foot submerged technique on the level of fatigue, quality of sleep, and quality of life among patients with cancer in selected hospital at Mangaluru. Journal of Health and Allied Sciences NU. 2024 Oct;14(04):499-506. doi: 10.1055/s-0044-1778721
15. Sunar S. An experimental study to assess the effect of hot water foot bath in patients with fever admitted in selected hospitals of Pimpri Chinchwad Municipal Corporation, Pune. Commun Public Health Nurs. 2017;2(1):25-9. doi: http://dx.doi.org/10.21088/cphn.2455.8621.2117.4
16. Jazayeri Z, Sajadi M, Dalvand H, Zolfaghari M. Comparison of the effect of foot reflexology and body massage on physiological indicators and bilirubin levels in neonates under phototherapy. Complementary Therapies in Medicine. 2021 Jun 1;59:102684. https://doi.org/10.1016/j.ctim.2021.1026٨٤
17. Abd Ali DK, Al-Hadrawi HH, Al-Fayyadh SA, Kamel AM, Al-Zayadi SD. Assessment of validity and reliability of the Arabic nursing core competencies scale-70. J ReAttach Therapy Developmental Diversities. 2023;6(2s):207-14.Retrived from https://jrtdd.com/index.php/journal/article/view/284
18. Vicens-Blanes F, Miró-Bonet R, Molina-Mula J. Analysis of the perceptions, knowledge and attitudes of parents towards fever in children: A systematic review with a qualitative meta-synthesis. Journal of Clinical Nursing. 2023 Apr;32(7-8):969-95. https://doi.org/10.1111/jocn.16271
19. AL-Shammiry SE, AL-Fayyadh S. Manual Pressure Verses Shot Blocker in Reducing Intramuscular InjectionRelated Pain: A Comparative Randomized Controlled Trial. Bahrain Medical Bulletin. 2024 Mar 1;46(1) doi.org/10.12816/0067152
20. Hameed AH, Shawq AH. Effect of educational strategies to develop nursing students' skills in pediatric procedures. Journal of Education and Health Promotion. 2025 Apr 1;14(1):143. doi: 10.4103/jehp.jehp_884_24

21. Shawq AH, Al-Musawi KM, Kalel MJ, Mahmod AA. The Effects of Music Interventions on Children's Pain Severity and Anxiety during Dressing Changes in Iraq: A Randomized Controlled Trial. Jurnal Keperawatan Soedirman. 2025 Mar 26;20(1):43-50. doi: 10.20884/1.jks.2025.20.1.13100
22. El-Naggar N, Mohamed H. Effectiveness of Warm Water Footbath on Temperature and Fatigue among Children with Fever. Evidence-Based Nursing Research. 2020 Oct 1;2(4):202-12. Retrieved from https://www.ajol.info/index.php/ebnr/article/view/225157
23. Serdar CC, Cihan M, Yücel D, Serdar MA. Sample size, power and effect size revisited: simplified and practical approaches in pre-clinical, clinical and laboratory studies. Biochemia medica. 2021 Feb 15;31(1):27-53. doi: 10.11613/BM.2021.010502
24. Kandulna MU. Effectiveness of Hot water foot bath on selected physiological parameters among patients with fever.2020. x(I).
25. Schneuer FJ, Demetriou E, Bond D, Lain SJ, Guastella AJ, Nassar N. Child characteristics and health conditions associated with paediatric hospitalisations and length of stay: a population-based study. The Lancet Regional Health–Western Pacific. 2023 Mar 1;32. https://doi.org/10.1016/j.lanwpc.2023.100706.
26. Naser SA, Al-Fayyadh S. Impact of Shot Blocker on Alleviating Peripheral Intravenous Cannulation Associated Pain among School-Aged Children: A Randomized Controlled Trial. The Malaysian Journal of Nursing (MJN). 2024 Oct 25;16(2):74-86. https://doi.org/10.31674/mjn.2024.v16i02.008
27. Isa HM, Isa AJ, Alnasheet MA, Mansoor MM. Fever assessment in children under five: Are we following the guidelines?. World Journal of Clinical Pediatrics. 2024 Mar 9;13(1):88864. doi: 10.5409/wjcp.v13.i1.88864
28. Rockers PC, McConnell M. Child gender and parental reporting of illness symptoms in sub-Saharan Africa. The American journal of tropical medicine and hygiene. 2017 Apr 5;96(4):994. doi: 10.4269/ajtmh.16-0249
29. Rahman A, Hossain MM. Prevalence and determinants of fever, ARI and diarrhea among children aged 6–59 months in Bangladesh. BMC pediatrics. 2022 Mar 5;22(1):117. https://doi.org/10.1186/s12887-022-03166-9
30. Mizal AA, Mohammed AQ. Comparison of sleep quality between outpatient and hospitalized children with respiratory tract dysfunction. Current Problems in Cardiology. 2024 Aug 1;49(8):102639. https://doi.org/10.1016/j.cpcardiol.2024.102639
31. Naeem AA, Ajil ZW. The Effect of Deep Breathing Relaxation Exercises on Pain Management During Chest Tube Removal in Children with Post-Cardiac Surgery. InMedical Forum Monthly 2025 Aug 2 ;36(7). https://doi.org/10.60110/36716
32. Gowsalya S. A Study to Evaluate the Effectiveness of Warm Water Foot Bath Therapy on Reduction of Body Temperature among Children with Fever in Selected Hospital, Perambalur (Doctoral dissertation,

Thanthai Roever College of Nursing, Perambalur).2019.
33. Wilbert J. Effectiveness of hot water foot bath therapy on temperature among patients with fever in SRM Medical College and Hospital, Kanjeepuram. Int J Sci Res. 2018;7(4):382-5.
34. Mandal I, Datta S, Ahamed N, De P. Effectiveness of warm water foot-bath therapy on physiological parameters of children with fever at a selected hospital, Kolkata, West Bengal. J Nur Sci Pract. 2015;4(2):43-57.
35. Seidi J, Ghanei Gheshlagh R, Nourifard Y, Dehvan F. The Effect of Foot Bath on Physiological Parameters and Anxiety in Patients With Acute Stroke: A Randomized Controlled Trial. Iranian Rehabilitation Journal. 2023 Sep 10;21(3):503-12.doi: 10.32598/irj.21.3.1874.1
36. Phiri KE, Sialubanje C, Hamainza B, Chiwaula J, Nawa M. The Prevalence and Factors Associated with Prompt Diagnosis and Treatment of Fever among Under-five Children in Zambia; Evidence from a Country-wide Cross-Sectional Survey. medRxiv. 2023 Sep 5:2023-09. doi: https://doi.org/10.1101/2023.09.05.23295058
37. Riya KK. A Study to Evaluate the Effectiveness of Warm Water Foot Bath Therapy in Reduction of Fever Among Adults in a Selected Hospital at Bangalore (Master's thesis, Rajiv Gandhi University of Health Sciences (India)). 2018.
38. Hard A, Upashe S. A study to assess the effectiveness of warm water foot bath therapy on fever among children admitted with fever, Dr. Vitthalrao Vikhe Patil Pravara Rural Hospital Loni (Bk). Journal of Emerging Technologies and Innovative Research. 2025 Sep 1; 12(12):355-259.