

Management of Fever in Children based on Persian Medicine: A Review Study

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Abstract

Background: Pediatric fever is the common cause of consultation in primary care services. Antibiotics that are prescribed widely, are not indicated in most patients. Using non-drug approaches in these situations can be helpful. We aimed to assess the information existing in Persian medical textbook for relieving pediatric fever and search their efficacies based on Conventional Medicine.

Materials and Methods: In this review study, data was extracted by searching a recent reliable Persian Medical Encyclopedia, "Exir-e A'zam" that is taught in Persian medical schools, and is the only reference that has a pediatric fever specific chapter. Then related information was searched and extracted from English (Medline, EMBASE and Web of Science, Scopus) and Persian (SID) online databases, based on both Persian and Conventional Medicine. The period of research was between 2000 and 2019.

Results: Based on Persian opinion, management of every disease had principles that called "health preservation management" (*Tadbir-e-hefz al-sehheh*) that was applied in addition to the main treatment. Management that was prescribed for pediatric fever include: evacuation and retention, sleep and wakefulness, manual interventions and nutritional orders. These methods have ingredients that were applied as oral or topical or in life style. In conventional medicine some physical modalities which are used include: ice packs, cooling blankets and sponging. Some medicinal herbs are suggested for relieving fever, after finding the reason for the fever and administering the main treatment.

Conclusion: According to this study, Persian medicine has several complementary and alternative methods that can reduce body temperature. Many of them can be effective based up on recent articles and conventional medicine. Further clinical studies are recommended to investigate their effectiveness.

Key Words: Children, Fever, Complementary Medicine, Persian Medicine.

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1- INTRODUCTION

Fever is the response of body to infections, inflammatory conditions, autoimmune diseases, cancers, endocrine disorders or even a drug's side effects (1, 2). The reasons may vary between infectious and noninfectious (3, 4), but it is more commonly due in children to infection (5). Fever is the most common reason for consultation in children, about 15-25% of consultations in emergency services and primary care departments (6). Approximately 1 in 4 children received antibiotic drugs during initial presentation in out-of-hours primary care contrary to recommended guidelines (7); in addition, parents are the first response, and fever causes parental worry (8), so usage of alternatives is the aim in this study, based upon the Persian medicine textbook.

Complementary medicine and alternative medicine seem to be the same. But their application is different. The Complementary medicine is a non-mainstream method that is applied together with conventional medicine; while, the Alternative medicines applied in place of conventional medicine. Integrative Health care usually links conventional and complementary methods together in a coordinated way (9, 10).

Different approaches are used in these branches of medicine, such as: physical, physiological and mental treatments by herbal, vitamins, and minerals, metabolic and clinical methods. But if they are used without proven efficacy, or with neglect of scientifically based treatment, objections may arise. On the other hand, there are some benefits that may lead to increased usage of complementary and alternative medicine (CAM) (11).

Persian medicine (PM, Iranian traditional medicine) is one of the ancient traditional medical systems. Its approaches to both treatment and health care are holistic. Now there is an evidence based approach in

Iran, thus it can be one of CAM methods for medical practitioners (12). Relevant to PM, human body consists of four humors (Khelt) including: Hot and wet temperament (Dam or Blood), hot and dry temperament (Safra or Yellow bile), Cold and wet temperament (Balgham or Phlegm), and Cold and dry temperament (Souda or Black bile). In healthy state, humors are in balance. By changing the quantities and qualities of humors, disease will happen that is named dystemperament (Su-e-Mizaj). Humoral fever is the most common fever in children, made by imbalance in quantity of humors or change in quality of them. Based on PM opinion, modification in lifestyle and nutrition, sport, footbathing, and massage can be used as treatment before or as well as the main treatment (herbal medicines or some surgical procedures). This principle applies for fever too. For humoral fever that is common in children, there are some treatments based on this rule (13). The aim in this study was to find CAM approaches for fever in children based on Persian medicine, by a review study.

2- MATERIALS AND METHODS

This review study is based on two scientific bases: PM textbook and conventional medicine. We investigate step by step management and treatments of humoral fever based on the book "*Exir-e A'zam*" (*Great Elixir*) that was written by *Muhammad A'zam Khan Nazim Jahan* (1902 AD). We chose this textbook because it was written relatively recently (20th CE). It is currently taught in PM schools in Iran and it is a reliable comprehensive textbook (Medical Encyclopedia). This book is the only book that has a specific section for pediatric fever. In this study, literature searches were done for new investigations about complementary and alternative treatments during fever, using Persian and Arabic keywords such as "tab, homma, koudak, tefl, atfal, homma, tebe-e sonnati, darman-

e mokammel and darman-e jaygozin", and English keywords such as "fever, pyrexia, hyperpyrexia, complementary treatment, alternative treatment, child, children, kids and Persian medicine", in English (Medline, EMBASE, Web of Science, and Scopus), and Persian (SID) online databases. The time period of research considered was from 2000 up to November 2019. Investigations were done to survey similarities, differences and find deficits or defects. Finally, to suggest a protocol for relieving pediatric fever besides the main treatments.

This article is based on the Ph.D. thesis in Persian Medicine in Tabriz University of Medical Sciences approved by the ethical code of IR.TBZMed.REC.1396.664. Inclusion criteria were the overall management written in the PM textbook for pediatric fever, and new articles that suggest CAM for this aim in the mentioned time period. Exclusion criteria were PM recommendations that were not currently available, or herbs with unknown identities.

3- RESULTS

At the end of this section, some data was extracted for CAM management of pediatric fever, based on both PM and Conventional Medicine viewpoints.

3-1. Persian medicine

Based on PM scholars' opinion, there are two kinds of heat in body. The normal one is called "*Hararat-e-gharizi*" (innate heat), that is the original warmth of body which makes it alive. The pathologic one is called "*Hararat-e-gharibe*" (foreign heat), that is produced by foreign reasons such as infections (13-17). Relevant to PM textbooks, all diseases divide into 4 stages:

- During stage 1 (*Ebteda*) disease starts, but signs and symptoms are in mild conditions, or sometimes there are no obvious signs or symptoms and

therefore disease may be neglected. This stage is definitely in all diseases.

- In stage 2 (*Tazayod*) the severity of signs and symptoms increases.
- By stage 3 (*Enteha*) condition of disease is stable, and it is like a plateau stage.
- During stage 4 (*Enhetat*) pathologic states start to decrease, so the body can recover (13, 14).

Fever may have some periodic times with intensity of fever that is called "*Nobe*" (intermittent) in PM textbooks. All 4 stages introduced previously repeat during each *Nobe* (13, 14). The first explanation of the world for the fever curve is in PM textbook, *Hidayat al-Muta'allimin fi al-Tibb* by Akhawayni. *Hidayat al-Muta'allimin fi al-Tibb* (The Students' Handbook of Medicine) is the first medical encyclopedia, i.e., as Persian language, written by Akhawayni (who was called as Joveini in Latin) (18, 19).

There are different kinds of classifications for fever, such as acute and chronic, daily and nightly (13). In PM, prevention is better than treatment; and in the prevention stage carrying out "health preservation management" (*Tadbir-e-hefz al-sehheh*) is necessary. This management considers "six essential principles" (*Setteh-e-zarurieh*), including: nutrition, movement and rest, sleep and wakefulness, psychological and mental reactions, evacuation and retention, weather. For being healthy and feel well all people have to respect these rules based on their temperaments. For all patients these rules have some suggestions too. In addition to the herbal drugs as main treatment, sometime manual interventions are useful, for example: dry cupping (*Badkesh*), wet cupping (*Hijamat*), and phlebotomy (*Fasd*) (13). **Table.1** shows some suggestions for treatment of pediatric fever beside the main therapeutic plan. Some herbal drugs are suggested for reducing pediatric fever, including:

Althaea officinalis L., *Matricaria chamomilla* L., *Mentha piperita* L., *Plantago major* L., and *Viola odorata* L. (20). In this research there are some herbal materials that can be used as food

or drink and methods of preparation of some remedies are followed (**Table.2**). The herbs based on these compounds are listed in **Table.2**.

Table-1: Health preservation management in pediatric fever.

Health preservation management category	Prescription (13)	Explanation
Evacuation and retention	Induction of urination	<ul style="list-style-type: none"> By: mixture of <i>oxymel</i> and <i>Apium graveolens</i> L (13).
	Enforce defecation (not diarrhea)	<ul style="list-style-type: none"> By: laxatives as oral, such as: <i>Maul-shaeer</i> + <i>oxymel</i>. Or <i>Maul-shaeer</i> + <i>Cotoneaster nummularius</i> Fisch. & C.A.Mey; and if this remedy does not lead to defecation, <i>Viola odorata</i> L. syrup has to be applied, that include. Rectal suppository that is useful for defecation, is made of: <i>Viola odorata</i> L. oil + <i>Beta vulgaris</i> L. leaves extract + <i>egg yolk</i> + <i>brown sugar</i> + <i>Borax</i> (13). Indication: If there is constipation (13). Extra explanation: laxative drugs (not purgatives) are for complete and comfortable defecation (13).
	Prescribe emetics	<ul style="list-style-type: none"> By: <i>oxymel</i> + warm water (13). Indication: If food material stuffed in stomach. This plan conflicts with fever by reducing humors in the human body (13).
	Induce sweating and dilation of skin pores	<ul style="list-style-type: none"> By: <i>Matricaria chamomilla</i> L. oil (topical) (13). Contraindication: acute fever (13). Extra explanation: Herbs that are prescribed should not have extreme hot temperament (13).
Sleep and wakefulness	Sleep rules	<ul style="list-style-type: none"> Indication: It is useful during stage 3 and 4 of fever (13). Contraindication: at stage 1 of fever (especially when it is an accompaniment of piloerection, chills and shivering) (13). Extra explanation: During summer it is not suggested to sleep in a cold place. It is better to wear some clothes and use an air conditioner to supply fresh for breathing (13).
Manual interventions	Phlebotomy or venesection	<ul style="list-style-type: none"> Venesection in age younger than 14 year old, is done in ears. For older children, Basilic or Brachial veins are selected (13-15). Indication: If there is Blood dominant dystemperament (13). Contraindication: below the age of 14 years old it is better to refrain from venesection. But if it is necessary, ears are suggested (15). Extra explanation: It is said in some PM textbooks that phlebotomy is contraindicated below the age of 14 years old. Hence, for children older than 6 months, if it is needed, bloodletting from the ears is suggested (15), or phlebotomy is applied for breastfeeding mothers (13, 15).
	Footbath and massage with oils	<ul style="list-style-type: none"> By: <i>Matricaria chamomilla</i> L. oil (massage) (13). Indication: Just at the stage 4 of fever (13).
Nutritional	Impermissible foodstuff	<ul style="list-style-type: none"> Fruits and fruit juices: They can change and putrefy in stomach during fever. They can cool the heat of fever; but they are not suitable for preparing the humors, thus it is better to prescribe after 1 week (13). Cold water: It is appropriate; but in cases with unprepared humors, it can increase the duration of fever and severity. Hence, it is better to avoid it (13). Dairy products: They can increase fever's severity (13). <i>Terminalia chebula</i> Retz.: It can lead to constipation (13).
	Permissible foodstuff	<ul style="list-style-type: none"> Food with cold and wet temperament: Because fever has hot and dry temperament, therefore qualities are opposite (13).
	<i>Jollab</i>	<ul style="list-style-type: none"> Recipe: There are several components but the main ingredients of <i>Jollab</i> in all recipes are saffron, rock-candy, rose water (13, 21). Contraindication: Yellow bile dystemperament (13).
	<i>Oxymel</i> (<i>Sekanjabin</i>)	<ul style="list-style-type: none"> Recipe: It is a medicinal syrup that consists of vinegar and honey. It is prepared by blending vinegar (1 unit), honey (2 units) in water (4 units), although exact amounts of each particle is different in

		<p>PM textbooks. Avicenna suggested that honey could be replaced by rock-candy or sugar (13, 22).</p> <ul style="list-style-type: none"> • Extra explanation: Its function and mechanism are <i>nozj</i> (i.e., rheological changes in eaten material in the human body), evacuation and cool. It means Oxydel by cold temperament can reduce temperature and even eject unhealthy humors from the body (13, 23).
	Honeywater (<i>Maul-asal</i>)	<ul style="list-style-type: none"> • Recipe: There are various methods in PM textbooks, but the basic components are honey and water. They are mixed and boiled over low heat and let them reach special concentration (24). • Contraindications: yellow bile dystemperament, inflammation in abdominal organs (such as liver and spleen) (13).
	<i>Maul-shaeer</i>	<ul style="list-style-type: none"> • Recipe: <i>Maul-shaeer</i> is prepared by boiling <i>Hordeum vulgare</i> L. in water (13). • Indication: During stage 1 of fever, diluted <i>Maul-shaeer</i> is prescribed. In stage 4, barley soup is given to patient. If there is pain, inflammation or severe side effects, it should be replaced with <i>jollab</i> or oxydel. • Contraindication: During stage 3, it is forbidden to prescribe. It can be replaced with <i>jollab</i> or oxydel. If it is necessary to prescribe <i>Maul-shaeer</i>, concentrated can be given.

Table-2: Herbs illustration extracted from CAM management based on PM.

Number	Scientific name (25)	Common name (26)	Persian name (26, 27)	Family (25)
1	<i>Apium graveolens</i> L.	Celery	<i>Karafs</i> /kæræfs/	Apiaceae
2	<i>Beta vulgaris</i> L.	Beet	<i>Choghondar</i> /tʃoɣondær/	Amaranthaceae
3	<i>Cotoneaster nummularius</i> Fisch. & C.A.May	Rockspray	<i>Sheer khesht</i> /ʃi:r khɛʃt/	Rosaceae
4	<i>Crocus sativus</i> L.	Saffron	<i>Zafaraan</i> /zæfæra:n/	Iridaceae
5	<i>Hordeum vulgare</i> L.	Common barley	<i>Jow</i> /dʒoʊ/	Poaceae
6	<i>Matricaria chamomilla</i> L.	Common chamomile	<i>Babouneh</i> /ba:bu:nɜ:/	Compositae
7	<i>Terminalia chebula</i> Retz.	Myrobalan	<i>Halileh</i> /hæli:lɜ:/	Combretaceae
8	<i>Viola odorata</i> L.	Sweet violet	<i>Banafsheh</i> /bænæʃɜ:/	Violaceae

CAM: Complementary and alternative medicine; PM: Persian medicine.

3-2. Conventional medicine

Based on viewpoint of conventional medicine, fever has some benefits, for example it is said that if a physician can induce fever, there is no need to search for another drug for treatment (28). But sometimes it is needed to decrease body temperature. The basic treatment of fever is the eradication of the underlying causes such as infections, inflammatory conditions, autoimmune diseases, cancers, endocrine disorders or even a drug's side effects (1). One kind of classifications of fever is based on duration. Acute fever lasts < 7 days and is particularly due to infectious diseases like viral upper respiratory tract infection. Sub-acute fever is characterized by less than 2 weeks

duration and occurs in cases of intra-abdominal abscess. Chronic or persistent fever that has >2 weeks duration, is seen during chronic bacterial infection such as tuberculosis (TB), viral infection e.g. HIV, and non-infectious diseases like cancers or connective tissue diseases (1). Another classification is related to height of fever: low, moderate and high grade and so hyperpyrexia. This option can have prognostic and diagnostic notions and is correlated with severity of disease. But the general condition of patient is more important than high body temperature (1). The main patterns of fever are: continuous or sustained fever that is characterized by a maximum of 1°C fluctuation in 24 h, and does not reach the normal level of body temperature. For example, lobar or gram-

negative pneumonia, urinary tract infection. Intermittent fever is defined as fever existence just several hours during the day, like TB and lymphomas. Remittent fever fluctuates daily more than 2°C without touching normal temperature. For instance, endocarditis and brucellosis. Continuous, intermittent or transient source of bacteremia can lead to continuous, intermittent or transient fevers. Relapsing fever is defined by recurring, but between fever periods there is no fever or just low grade fever. The noticeable point is that the reason of specificity of fever patterns to certain diseases is unknown (1). However, patients who consume antibiotics and antipyretics before visiting a physician, may show uncharacteristic fever patterns (1). For malaria, defined periods of fever are related to pathogenesis of the disease. Life cycle of parasite leads to periodicity of fever every day (quotidian), 48h (tertian),

and 72h (quartan). In rare condition of Hodgkin's disease febrile periods of 3-10 days occurs (1). For suppression of fever, antipyretic drugs like acetaminophen, aspirin and non-steroidal anti-inflammatory drugs (NSAIDs) can be prescribed. The antipyretic mechanism for this group is the inhibition of prostaglandin synthesis and diminishing the hypothalamic set point to normal level. They also can relieve inflammation and pain (29). In addition to administration of drugs, physical modalities are used, for instance: ice packs, cooling blankets and sponging. Sponging with tepid water in addition to antipyretic drugs can be useful for reducing temperature in febrile children (30, 31). In textbooks and articles, some herbs introduced for treatment of fever are listed in **Table.3**. Some of these herbs were introduced as antipyretic based on PM textbooks too (20).

Table-3: Medicinal herbs used for reducing Pediatric fever based on Conventional Medicine.

No.	Scientific name (25)	Common name	Persian name	Family (25)	Conventional Medicine
1.	<i>Achillea millefolium</i> L.	Yarrow	<i>Boumadaran</i> /bu:ma:dæra:n/	Compositae	Anti-inflammatory (32-34), Antimicrobial (35,36), Diaphoretic (33,37), Antipyretic (37)
2.	<i>Allium sativum</i> L.	Garlic	<i>Seer</i> /si:r/	Amaryllidaceae	Anti-inflammatory (38-40), Antimicrobial, Antiviral (37), Antipyretic (38)
3.	<i>Althaea officinalis</i> L.	Marshmallow	<i>Khatmi</i> /khætmi/	Malvaceae	Anti-inflammatory, Antimicrobial, Antifungal (41, 42), Antipyretic (43)
4.	<i>Citrus limon</i> (L.) Osbeck	Lemon	<i>Limou</i> /li:mu:/	Rutaceae	Anti-inflammatory (44, 45)
5.	<i>Hyssopus officinalis</i> L.	Hyssop	<i>Zoufa</i> /zu:fa:/	Lamiaceae	Anti-inflammatory (46, 47), Antipyretic (36)
6.	<i>Lavandula angustifolia</i> Mill.	English lavender	<i>Ostokhodous</i> /ostokhodu:s/	Lamiaceae	Anti-inflammatory (48, 49), Antimicrobial (37, 48), Antipyretic (36, 37)
7.	<i>Matricaria chamomilla</i> L.	Common chamomile	<i>Babouneh</i> /ba:bu:n3:/	Compositae	Anti-inflammatory, Antibacterial, Diaphoretic, Antipyretic (36, 37, 50, 51)
8.	<i>Mentha piperita</i> L.	Peppermint	<i>Nanaa</i> /næna:/	Lamiaceae	Anti-inflammatory, Antibacterial, Antifungal, Antiparasitic (52-54), Antipyretic (36, 37)
9.	<i>Plantago major</i> L.	Great plantain	<i>Barhang</i> /ba:rhaeng/	Plantaginaceae	Anti-inflammatory, Antibacterial, Antiviral, Antifungal, Antipyretic (55, 56),
10.	<i>Sambucus nigra</i> L.	European elder	<i>Aghti siah</i> /a:ghti si:ja:h/	Adoxaceae	Anti-inflammatory (57, 58), Antipyretic (36, 37, 58)
11.	<i>Tilia cordata</i> Mill.	Small-leaved lime	<i>Zirfoun</i> /zi:rfu:n/	Tiliaceae	Anti-inflammatory (59), Antipyretic (37)
12.	<i>Viola odorata</i>	Sweet violet	<i>Banafsheh</i> /bænaʃʃe:/	Violaceae	Anti-inflammatory, Antibacterial, Antiviral, Antifungal, Antipyretic (60-62)

4- DISCUSSION

This investigation is the first review study that explores CAM approaches for relieving pediatric fever in addition to treatment of underlying ailments based on PM and conventional medicines. This article assays some traditional methods and the related current studies, and finally compares them. PM scholars believed in two kinds of heat, one of them is protective and another is harmful (13-15). Conventional medicine said that keeping the body in normal range of temperature is necessary. Excess temperature may be a blessing or curse (1). Based on both conventional and traditional Persian medicine, some fever classifications are the same, like duration and severity (1, 13); but there are some differences too because the basics of these two viewpoints are not the same. The main classifications of fever in PM are based on humors, and there are justifications for every fever pattern. Thus, we can integrate both conventional and traditional opinions and fill the unknown conditions. PM scholars were the first scientists that know about the period of fever and intermittent fevers (18). The important point is that there are different recommendations for food, drink, sleep, taking a bath and rest (13); but in conventional medicine it is not mentioned.

According to PM textbooks, a healthy lifestyle by considering "six essential principles" can lead to health. These rules have to be obeyed during health and disease, but may vary based on temperaments (13). The details of this management are supported by recent articles. In recent studies Oxymel and *A. graveolens* have a diuretic effect (22, 63). *B. vulgaris* has anti-inflammatory and immunomodulatory effects (64, 65). *C. nummularius* is prescribed as febrifuge (66). Some studies showed that *M. chamomila* has diaphoretic and antipyretic effects (36, 37). *V. odorata* is accepted for relieving fever (60). *Jollab* can have anti-

inflammatory and antinociceptive effects (21). *C. sativus* that is applied in *Jollab* is an antipyretic herb by anti-inflammatory and immunomodulatory properties (67). Oxymel (*Sekanjabin*) has three kinds of effects: therapeutic, modifier (reducing unwanted or side effects) and reinforcing effects. For therapeutic aspect, it is diuretic, laxative and expectorant (22). Based on recent articles, *Honywater* has antibacterial and antipyretic effects (24), but it is noticeable that usage of honey is forbidden for kids under one year old (68, 69). Some studies showed that *Maul-shaeer* can be useful for relieving fever. It has diuretic and diaphoretic effects too (70). Table.3 showed that conventional medicine concerned some herbs that can be used for fever. Some of them are recommended in PM textbooks too (20). But more clinical trials need to approve dosage of these herbs for children, food and drug interactions and side effects. After approval, they can be used for drug formulations.

Some articles declare that treatment of a mother who breastfeeds her baby is one of choice during treatment of fever in child (20), for example, if the infant ingests the mother's milk and venesection is necessary, we can apply it to the mother (13-15). Recent studies showed that sleep is related to immune system and defense system (71). In PM textbooks the first step for treatment of every sickness is having a healthy defecation (13, 14). But there were no recent studies supporting the idea that by relieving constipation, temperature will reduce. Hence, we propose that an investigation for evaluation of this assumption will be helpful. Despite several recommendations suggested in PM textbooks for relieving fever in simple ways in addition to cardinal treatment, there are insufficient approaches in conventional medicine guidelines. The unique complementary method applied in conventional medicine for fever is cooling.

This article shows some different methods for this aim that are practical, cost effective and effective; but there are insufficient evidence based clinical trials for approving these recommendations. This study can be a base for more studies. Some of the strengths of this study are being the first investigation of CAM approaches for pediatric fever based on both traditional and conventional viewpoints. Conventional medicine suggests just some cooling methods, but not about nutrition, bathing, sleep or rest of patients; while these principals are mentioned in PM. The weakness of this study is considering just humoral fever that is common in children, not other kinds of fever. It needs to prove the effectiveness of these methods for children by clinical trials.

5- CONCLUSION

This article is the first narrative study based on PM textbook for finding the CAM methods for relieving pediatric fever in addition to treatment of underlying reason. The result offers that "six essential principles" have not been mentioned in conventional practical care. In conventional medicine there is inappropriate consumption by patients and prescription of antipyretics by health care personnel; but the only CAM method mentioned is ways of cooling. This investigation showed some new recommendations that can be considered as part of management during main treatment. Although, these approaches need more clinical evaluations.

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7- CONFLICT OF INTEREST: None.

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