Causes, Fever In Children Under 5Years
Knowledge, Attitude and Practices of Mothers And Health Team Towards The Management of Acutely Febrile Children


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قال تعالى:

(وَقَالَ رَبِّ أُرِزَعْتُ أَنْ أَشْكُرْ نَعْمَتَكَ الۡتِي
أَنَعَمْتَ عَلَيٍّ وَعَلَى الَّذِي وَأَنَّ أَعْمَلَ صَالِحًا
تَرْضَاهُ وَأَدْخِلْنِي بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ)

صدق الله العظيم

سورة النمل الآية (19)
DEDICATION

To my Dear parents,
Husband and Kids

To all children in my country
ACKNOWLEDGEMENT

I am extremely grateful to my supervisor Profess Zein AlAbdeen A. Karrar for his advise, support, patience, encouragement and guidance throughout the study.

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My appreciation is forwarded to all mothers and children for their consent and cooperation in this study.

My great appreciation is forwarded to my family for support and tolerance.

I'm thankful to Miss Samia who typed this thesis.
ABSTRACT

This is a cross sectional hospital based study conducted during the period of July, August and September 2003 including pediatric casualties and units of KECH, KTH, KNTH, Omdurman TH and Ahmed Gasim PTH.

The study included 268 acutely febrile children under 5 years, 292 mothers, 75 doctors, 123 nurses. The main objectives were determining causes of fever in children and assessing knowledge, attitude and practices of mothers, doctors and nurses towards management of febrile child.

The most common causes of fever in the study group were respiratory tract infections (61.5%) and malaria in (15.7%). Less common were diarrhoeal diseases (07.1%), otitis media (03.7%), urinary tract infections (02.2%), measles (03.7%), urinary tract infections (02.2%), measles (02.6%) and (07.1%) were other causes such as osteomyelitis, meningitis and viral infections.

Mothers show poor knowledge about fever. Few mothers (1%) believe that fever is beneficial. Only (15%) can define it in terms of degrees. They treat it aggressively, worry about it and utilize harmful practices. It is found that cold sponging is used by two thirds of them (66.1%), one third use sponging as the first line of treatment, (12.4%) still use aspirin as antipyretic and high proportion used to practice self treatment of fever by drugs.

There was significant correlation of mother’s knowledge attitudes and practices with educational level. Highly educated mothers have better knowledge, attitude and practices than low educated mothers.
Few mothers (3.1%) use traditional methods to treat fever at home. The common traditional means were covering the febrile child’s skin surface with sesame oil for which other herbal materials can be added like garad or kammon. Other means lubkha, duckan, cauterization, scarring and uvula removal.

There was significant difference in knowledge and attitude between house officers, medical officers, and registrars. The later have better knowledge than house officers and medical officers. About fifty four percent of doctors in the study were house officers, (22.7%) were medical officers and registrars were also (22.7%). Most of them 70.7% know the cut-off level of fever, but high proportion (60%) don’t know the pathophysiology of fever and treat fever to prevent convulsions. Only a small percentage (22.7%) is familiar with different antipyretic forms, concentrations and doses. (34%) of the doctors did not have teaching about fever in their undergraduate teaching.

Nurses included in the study have great deficiency in knowledge about thermometers and only one fourth (24.6%) of them measure temperature correctly.

In the study area which includes 46 facilities, there is one thermometer per one facility in 18 facilities (39.1%) and only 10.8% had temperature chart.
ملخص الأطروحة

593 كتَبَتِها لولا نوروف يار 268 KÖHÖVÖKÖL

.تُقَدِّمُتْ لِلْإِجْعَالِ لِلْفُحْصِ

463. يُذْعَمُ أنَّ 5 من 23 مَرَّةً، 292 287933

311. أنَّ 5 نَتِيَّةً، 3 و 59 333

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117. أنَّ 2003 أنَّ 593

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كليت البولى هو نوع من أنواع البول الذي يحتوي على نسبة عالية من الكبريت وذرات البوليات. هذا النوع من البول يمكن أن يكون مسببًا لصعوبة في التفتيح بسبب الكريستالات البيضاء المرئية في البول. 

لا يوجد לך اضطرابات في البول من خلال مراقبة البول أو التحليل. الهدف من هذا الدراسة هو تحليل نسبة الكريستالات البيضاء في البول وتحديد عوامل تأثيرها على النسبة. 

هذا الدراسة حددت بعض العوامل التي تؤثر على نسبة الكريستالات البيضاء في البول. من بين هذه العوامل، كانت نسبة الكريستالات البيضاء المرئية في البول زائدة في البوليات. 

النتائج الجذرية من الدراسة تشير إلى أن هناك علاقة بين نسبة الكريستالات البيضاء في البول ونسبة الكريستالات البيضاء المرئية في البول. من خلال تحليل هذه العوامل، يمكننا فهم أفضل لعوامل تأثيرها على نسبة الكريستالات البيضاء في البول. 

تهدف الدراسة إلى فهم أفضل للعوامل التي تؤثر على نسبة الكريستالات البيضاء في البول وتحديد عوامل تأثيرها على النسبة. من خلال تحليل هذه العوامل، يمكننا فهم أفضل لعوامل تأثيرها على نسبة الكريستالات البيضاء في البول. 

توصيات الدراسة: 

- تحقق من البول يوميًا للتفتيح. 
- استخدام أجهزة الرؤية الصناعية للتفتيح. 
- استخدام مختلف أنواع البوليات للتفتيح. 
- إجراء تحليلات بيولوجية للتفتيح. 

النتائج: 

- نسبة الكريستالات البيضاء في البول زائدة. 
- نسبة الكريستالات البيضاء المرئية في البول زائدة. 
- العوامل التي تؤثر على نسبة الكريستالات البيضاء في البول. 

الخلاصة: 

تهدف الدراسة إلى فهم أفضل للعوامل التي تؤثر على نسبة الكريستالات البيضاء في البول وتحديد عوامل تأثيرها على النسبة. من خلال تحليل هذه العوامل، يمكننا فهم أفضل لعوامل تأثيرها على نسبة الكريستالات البيضاء في البول.
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<td>Gadu/postgrad</td>
<td>Graduate or postgraduate</td>
</tr>
<tr>
<td>HO</td>
<td>House-officers</td>
</tr>
<tr>
<td>HW</td>
<td>Health workers</td>
</tr>
<tr>
<td>IL</td>
<td>Interleukin</td>
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<tr>
<td>INF</td>
<td>Interferrons</td>
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<tr>
<td>KECH</td>
<td>Khartoum emergency children hospital</td>
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<tr>
<td>KNTH</td>
<td>Khartoum north teaching hospital</td>
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<tr>
<td>KTH</td>
<td>Khartoum teaching hospital</td>
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<tr>
<td>MA</td>
<td>Medical assistants</td>
</tr>
<tr>
<td>MO</td>
<td>Medical-officers</td>
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<tr>
<td>PG</td>
<td>Prostaglandin</td>
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<td>Paediatric teaching hospital</td>
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<td>TH</td>
<td>Teaching hospital</td>
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<td>TNF</td>
<td>Tumour necrosis factors</td>
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1. Introduction and Literature Review

Fever is perhaps the ancient most universally known hallmark of disease and may reflect a mild illness as well as a serious one (1). It’s also a common symptom which prompts parents to bring their child to the clinic or hospital (2,3). Fever occurs not only in mammals, but also in birds, reptiles, amphibia and fish. When it occurs in homeothermic animals, the thermoregulatory mechanisms behave as if they were adjusted to maintain body temperature at a higher than normal level, i.e., “as if the thermostat had been reset” to a new point above 37°C (1).

1.1. Normal Body Temperature:

In humans, the traditional normal value for the oral temperature is 37°C (98.6°F), but in one large series of normal young adults, the morning oral temperature averaged 36.7°C with a standard deviation of 0.2°C. Therefore 95% of all young adults, would be expected to have a morning oral temperature of 36.3-37.1 “97.3-98.8°F” (mean ± 1.96 standard deviations) (1).

The normal human core temperature undergoes a regular circadian fluctuation of 0.5-0.7°C (1). It fluctuates according to
the time of day, from a low of 36.1°C between 2am to 8am to a high of 38°C rectally between 4-9 pm (2).

In children, the temperature in the axilla or groin is about 0.5°C lower, and the rectal temperature is about 0.5°C higher than the oral temperature. The temperature of normal children is between 36.5 and 37.5°C and is about 1°C higher in infants than in older children (4).

The traditional teaching that normal body temperature is 37°C is too restrictive because it has been found that the upper limit of the normal body temperature is 37.7°C in adults and 37.9°C in children (5).

1.2. Definition of Fever:

Clinically fever is defined as body temperature of 1°C or greater above the mean standard deviation at the site of recording. A rectal temperature above 38°C (100.4°F) and an axillary one above 37.2°C (99.0°F) are generally accepted as fever (6-9). Now, it’s currently accepted that an axillary temperature of 37.5°C or more is fever in under 5 years children. Mild elevations can be caused by exercise, warm
food and drinks. If one of these is present, it should be eliminated and the temperature retaken in one half hour (2).

1.3. Temperature-Regulation Mechanisms and Pathophysiology:

Body temperature is regulated by thermosensitive neurons located in the preoptic area or anterior hypothalamus. These neurons, respond to changes in the temperature of blood circulating in the hypothalamus as well as direct neural connections with cold and warm receptors located in the skin and muscles (11). Thermoregulatory responses include autonomic, somatic, endocrine and behavioral changes. One group of responses increases heat loss and decreases heat production; the other decreases heat loss and increases heat production. These responses include redirecting blood to or from cutaneous vascular beds, increased or decreased sweating, extracellular fluid volume regulation (via arginine vasopressin), and behavioral responses, such as seeking a warmer or cooler environmental temperature. Fever is regulated in the same manner as normal temperature is maintained in a cool environment, the difference being that the body’s thermostat has been reset at
a higher temperature\textsuperscript{(11)}. Temperature regulation is less precise in young children, and they may normally have a temperature that is 0.5°C or so above the established norm for adults \textsuperscript{(1)}.

Regardless of whether fever is associated with infection, connective tissue disease or malignancy, the thermostat is reset in response to endogenous pyrogens including the cytokines interleukin (IL) – \( \beta \) and IL – 6, tumor necrosis factor \( - \alpha \) (TNF-\( \alpha \)), and interferon (IFN) – \( \beta \) and IFN-\( \gamma \). Stimulated leukocytes and other cells produce lipids that also serve as endogenous pyrogens. The latter is called macrophage – inflammatory protein-one \textsuperscript{(1)}. The effect of endogenous pyrogen on the hypothalamus is due to an increase in prostaglandins, the mechanism of which is currently unknown \textsuperscript{(12)}. The best – studied lipid mediator is prostaglandin E\(_2\) \textsuperscript{(11)}. During fever, not only pyrogens are being produced but also antipyretic substances. Two of them are arginine vasopressin and melanocyte–stimulating hormone\textsuperscript{(12)}. Most endogenous pyrogen molecules are too large to cross the blood-brain barrier in an efficient manner. However, circumventricular organs in close proximity to the hypothalamus lack a blood
brain barrier and allow for neuronal contact with circulating factors through fenestrated capillaries. Microbes, microbial toxins or other products of microbes are the most common exogenous pyrogens. There are substances that come from outside of the body, stimulate macrophages and other cells to produce endogenous pyrogens, and result in fever. Some substances produced within the body are not pyrogens but are capable of stimulating endogenous pyrogens. Such substances include antigen – antibody complexes in the presence of complement, complement components, lymphocyte products, bile acids, and androgenic steroid metabolites. Endotoxin is one of the few substances that can directly affect thermoregulation in the hypothalamus as well as stimulate endogenous pyrogens release\(^{(11)}\).

1.4. Fever Benefit – risk ratio:

Animal studies have shown an enhanced resistance to infection and improved survival associated with temperature elevation\(^{(2)}\). Increasing body temperature in response to microbial pathogens is a response observed in reptiles, fish, birds and mammals. When they are given an exogenous pyrogen, they swim to warmer water to raise their body
temperature to the febrile range. The benefit of fever to the organism is uncertain. It presumably beneficial, because it has evolved and persisted as response to infections and other diseases. Many micro-organisms grow best within a relatively narrow temperature range, and a rise in temperature inhibits their growth. In addition, antibody production is increased when body temperature is elevated. Before the advent of antibiotics, fevers were artificially induced for the treatment of syphilis and proved to be beneficial\(^{(1)}\). Fever causes a general increase in immune system function e.g., increased proliferation of lymphocytes, increased \(\gamma\)-interferon production, increased chemotaxis of polymorphs, increased alternative complement pathway activation and increased antibody production. Also, some antimicrobials are more active at febrile temperatures. Some pathogens such as streptococcus pneumoniae may be directly inhibited by elevated temperatures while others become more susceptible to the bactericidal effect of serum and/or antimicrobials \(^{(2)}\). Thus, in humans most evidence suggests that fever is an adaptive response and should be treated only in selected circumstances \(^{(11)}\).
Fever itself causes no harm unless it reaches at least 41.7° C. Seldom do children have fever > 40°C, especially if they are < 3 months old. Fortunately, the brain thermostat keeps almost all untreated fevers due to infection below 41.7°C \(^{(2)}\). However, very high temperatures are harmful, when the rectal temperature is 41°C for prolonged periods, some permanent brain damage results. When its over 43°C, heat stroke develops and death is common \(^{(1)}\).

Except under unusual circumstances, fever by itself is not beneficial to the host response to infection. Heat production associated with fever increases oxygen consumption, carbon dioxide production and cardiac output. Thus it may exacerbate cardiac insufficiency in heart disease or chronic anaemia (e.g., sickle cell disease), pulmonary insufficiency in those with chronic lung disease, and metabolic instability in children with diabetes mellitus or inborn errors of metabolism \(^{(13)}\).

Furthermore, children between the ages of 6 months and 5 years are at increased risk of benign febrile seizures, whereas those with idiopathic epilepsy may have increased frequency of seizures as part of a nonspecific febrile illness.
Whereas all children will experience fevers, only 3-4% will have a febrile convulsion. They are rare before 9 months and after 5 years, benign, spontaneously remit without specific therapy and uniformly has excellent prognosis\(^{(11)}\).

For most normal children, the seizure threshold is about 41.1\(^{\circ}\)C. If the child is neurologically abnormal, seizures may occur at lower temperatures\(^{(2)}\). Febrile seizures are caused by the height of the fever and not the rapidity of the rise, although they are associated with rapidly rising temperatures and usually occurs when core temperature reaches 39\(^{\circ}\)C or greater\(^{(11)}\).

Other complications of fever are dehydration and heat strokes. Because children have a greater surface area per weight than adults, this leads to greater losses through the skin. Thus when fluid intake is interrupted e.g., during gastroenteritis, dehydration is a more likely consequence in the child. Heat strokes in children are due mostly to inadvertent heat overload e.g., over wrapping and being left in a car in direct sunlight. Heat strokes are preventable\(^{(14)}\).

1.5. Epidemiology and Causes of fever:
Fever is often accompanied by symptoms and signs that suggest a diagnosis or at least point to an organ system such as headache, cough, diarrhoea, dysuria et. However, this not always the case. This distinction provides a convenient means of categorizing causes of fever in children:

- Localizing symptoms or signs.
- Associated presentation e.g., rash.
- No localizing signs \(^{2}\).

Also, it may be categorized as:

- Fever of short duration with localizing signs for which the diagnosis can be established by clinical history and physical examination, with or without laboratory tests.
- Fever without localizing signs, for which the history and physical examination do not suggest a diagnosis but laboratory test may establish an etiology.
- Fever of unknown origin \(^{13}\).

The causes of fever include infection, vaccines (Pertussis, influenza virus, measles), biologic agents (Granulocyte-macrophage colony-stimulating factor, interferon, interleukin), tissue injury (infarction, pulmonary emboli, trauma, intramuscular injections, burns), malignancy.
(Leukemia, lymphoma, hepatoma and metastatic disease, drugs (drug fever, cocaine, amphotericin B), immunologic – rheumatic disorder (SLE, RA), inflammatory disease (inflammatory bowel disease), granulomatous diseases (sarcoidosis) endocrine disorders (thyrotoxicosis, pheochromocytoma), metabolic disorders (gout, uremia, Fabry’s disease, type I hyperlipidaemia), genetic familial mediterranean fever) and poorly understood entities\(^{(11)}\).

Factitious (self-induced) fever may be due to intentional manipulation of the thermometer or injection of pyrogenic material \(^{(11)}\). The final common pathway of most causes is the production of endogenous pyrogens which then directly alter the hypothalamic temperature set-point \(^{(13)}\).

Between 20 and 30\% of all children’s visits to emergency department are for acute episodes of fever \(^{(5)}\). In the first 2 years of life, children average four to six episodes of fever. Most frequently, the cause of the fever is a viral illness, usually in a seasonal pattern in Australia during the period from April through to September, when there is an increase in the community of acute infections caused mostly by
respiratory and gastrointestinal pathogens, such as respiratory syncytial virus and rotavirus respectively (5).

The common symptoms and signs of fever with a local focus are respiratory (e.g., cough and rhinorrhea), urinary, (dysuria and frequency of micturition), gastrointestinal (vomiting, diarrhoea and abdominal pain), neurological (headache, neck stiffness and bulging fontanel), orthopedic (joint pain or swelling, bone pain on refusal to move the limb) and cardiac signs like a murmur. According to this, common causes are common cold, influenza, pharyngitis and are by far the most common causes of fever. Others are urinary tract infection, viral gastritis, gastroenteritis, food poisoning and dysentery. Others are viral arthritis, osteomyelitis and septic arthritis. Uncommon causes are otitis media, croup and sinusitis, typhoid fever, acute appendicitis, hepatitis and meningitis, meningoencephalitis, encephalitis and acute gastroenteritis with dehydration. Normal children may experience up to 12 viral infections (mostly respiratory) a year with no symptoms in between episodes (2). Other common viral pathogens frequently seen in the ED that cause fever include varicella (chickenpox), parvovirus B19 (erythema infectiosum), Herpes virus type 6 (Roseola infantum),
Coxsackie B5, echo 9 and Coxasackie A_{16} enterviral\textsuperscript{(5)}. The rash which may be associated with fever can be erythematous as in measles, rubella, roseola infantum, erythema infection, infectious mononucleosis, dengue fever, cellulitis, drug reactions, erythema multiforme, connective tissue disease and Kwasaki’s disease. Roseola infantum is a common exanthem caused by human herpes virus 6 and often diagnosed as a drug allergy\textsuperscript{(2)}.

Measles infection can still occur despite immunization.\textsuperscript{(2)} Urinary tract infection and viral fever are considered as common causes of fever with no localizing symptoms or signs.

Uncommon causes of fever without a focus may be typhoid fever, malaria, drug fever and sepsis syndrome\textsuperscript{(2)}. Approximately 30\% of febrile children 3mo-3yr of age have no localizing signs of infection. Occult bacteremia (without an obvious focus of infection) due to S. pneumonia, H.influenza type b, N. meningitides, and Salmonella spp occurs in approximately 4\% of relatively well appearing children between 3 and 36mo of age with fever (rectal temperature \( \geq 38^\circ\text{C} \)). S.pneumoniae accounts for 85\% of cases of occult
bacteremia, H.influenzae type b, N. meningitides and salmonella spp accounting for the remaining positive cultures. Otitis media, upper respiratory tract infection, pneumonia, gastroenteritis, urinary tract infection, osteomyelitis are considered as common bacterial infections among children between 3 and 36 months. In this age group, bacteremia is present in 11% of febrile children with pneumonia and 1.5% of those with otitis media or pharygitis\(^{(11)}\).

Risk factors indicating increased probability of occult bacteremia include temperature exceeding 39ºC, total WBC count greater than 15.000/µl, or an elevated absolute neutrophil count, band count, erythrocyte sedimentation rate, or C. reactive protein. The incidence of bacteremia among infants between 3 and 36 months increases as the temperature and WBC count increase, to 13% if the temperature is higher than 39.0ºC and WBC count exceeds 15.000/µl. However, no combination of laboratory test or clinical assessment is completely accurate in predicting the presence of occult bacteremia\(^{(5,11)}\).

Socioeconomic status, race, sex and age do not affect the risk for occult bacteremia. The increased incidence of
bacteremia among febrile 3-36 months-old children may be due in part to a maturational immune deficiency in the production of opsonic IgG antibodies to the polysaccharide antigens present on these encapsulated bacteria\textsuperscript{(11)}. 

1.6. Management of the Febrile Children:

The vast majority of febrile illnesses in infants and young children are due to self-limiting viral infections\textsuperscript{(5)}. It’s important to define the cause of the fever instead of just treating the fever empirically. Persistent fever reported by parents may be a series of self-limited viral illnesses rather than a persistent pyrexia. Management of fever needs to take into account the toxicity, immune status and age of the patient as well as the sources of the infection\textsuperscript{(2)}.

The most important challenge facing a physician confronting febrile children is to exclude serious diseases. The history and physical examination are often sufficient. Toxic appearing children (i.e., with lethargy, signs of poor perfusion, or marked hyperventilation, hyperventilation or cyanosis) may require hospitalization. In the absence of
serious signs of illness, however, the parents should be reassured \(^{(10)}\).

Among preschool children it is often caused by relatively harmless, self-limiting viral infections, including influenza-like diseases and acute upper respiratory tract infections \(^{(15)}\).

In these cases, fever is considered a beneficial part of the body’s defense mechanisms against infections, and from a medical point of view there are actually few reasons for antipyretic therapy \(^{(16,17)}\).

Fever is defined also as “the state of elevated core temperature, which is often, but not necessarily, part of the defensive responses of multicellular organisms to the invasion of pathogenic or inanimate matter recognized as alien to the host”. \(^{(18)}\). Though fever was considered a protective response for thousands of years, and was even induced by physicians to combat certain infections, the advent of antipyretic drugs, had led to the common belief that fever is maladaptive and harmful \(^{(6,19)}\). Fever helps curtail the replication of invasive microorganisms and enhances natural killer-resistant malignant cells \(^{(20)}\).
When evaluating children who have fever, the most critical diagnostic manoeuver is the carefully performed clinical evaluation, observation, history and physical examination. Laboratory studies may be ordered based on the results of the clinical evaluation as well as the child’s age and height and duration of fever.\textsuperscript{(21)}

Simple criteria, including medical history, clinical and hematological evaluation have been proposed to identify young febrile children at low or high risk of severe bacterial infection.

The purpose of these criteria is to reduce the number of infants hospitalized unnecessarily and to identify infants who may be managed as outpatients by using clinical and laboratory criteria. In children with fever without sources, occult urinary tract infections occur in 3-4% of boys younger than 1 year and 8-9% of girls younger than 2 years of age.

It was found that twenty percent of febrile children have fever without apparent source of infection after history and examination. Occult pneumococcal bacteremia occurs in 3% of children younger than 3 years with fever without a source with a temperature of 39°C (102.2°F) or greater and only 3% of them may later have meningitis\textsuperscript{(22)}.  

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There are two key management decisions that face physicians caring for children with fever without source: the initiation and use of antimicrobial therapy, and inpatient versus outpatient management\(^{(23)}\).

Fever with temperature less than 39ºC in healthy children generally do not require treatment. As temperatures become higher, patients tend to become more uncomfortable and administration of antipyretics often makes patients feel better. Other than providing symptomatic relief, antipyretic therapy does not change the course of infectious diseases in normal children. Antipyretic therapy is beneficial in high-risk patients who have chronic cardiopulmonary diseases, metabolic disorders, or neurologic diseases and in those who are at risk of febrile convulsions. Hyperpyrexia (>41ºC) places patients at higher risk than do lower temperature responses. It's associated with severe infections, hypothalamic disorders, or central nervous system hemorrhage and always requires antipyretic therapy\(^{(11)}\). It's recommended to treat a child's fever with antipyretic medications only if the temperature is over 39ºC (Rectally) and preferably, only if the child is uncomfortable\(^{(19)}\). Recent data has confirmed the notion that
children feel better if their fever is reduced and show improvement in their activity and alertness\cite{24}.

Although antipyretic therapy will prevent extreme temperature elevations from causing permanent brain damage to the CNS, there have been no cases of documented brain damage from interleukin-1 mediated fever\cite{25}. Furthermore, antipyretics or sponging can not prevent febrile convulsions, their recurrence\cite{26,27} or decrease their incidence\cite{11}.

There are situations where adverse drug side effects associated with the use of antipyretics outweigh the benefits of fever reduction. In other situations reducing fever may obscure diagnostic or prognostic signs as in neutropenic children who have recently received chemotherapy\cite{5}. Antipyretics alter the pattern of fever, and temperature can “overshoot” the normal range resulting in a compensatory hypothalamic response and a new fever spike equal or greater than the initial temperature\cite{28}. Their use has also been associated with prolonging illness, for example, increased recovery time from measles and chicken pox\cite{25} and increased viral shedding from rhinovirus\cite{28}. So, the paediatric policy of prescribing medications to lower the fever is not intended to
hasten recovery but merely to reduce the child’s discomfort (29). The insistence on obsessional antipyretic measures will only enhance fever phobia in parents (27). Because the rate of fluid loss may be increased as the temperature rises, it’s important for the febrile child to receive adequate hydration. In addition maintenance of adequate intravascular volume allows for better heat dissipation. Excessive clothing may be removed (5). Other non-pharmacological adjunctive measures, such as sponging with tepid water, are no longer recommended and may even result in an elevation of core body temperature (5). Sponging should be used for T° > 38.5 and after administration of antipyretic drugs. If the fever is > 38°C half an hour after drugs, sponging for 30 minutes in Lukewarm water (Temperature of the water 29.5°C-32°C) is done sponging should be done immediately if the child is delirious or fitting from fever. Sponging works much faster than immersion. The child being sit in 2 inches of water and his skin surface is wetted. If shivering occurs, temperature of water showed be raised. Fever should not be expected to be lowered below 38.3°C. It was found that sponging febrile children with tepid water after antipyretic therapy had no more
effect on defervescence than the antipyretics alone \(^{(2)}\). Others recommend sponging febrile children with water of 37°C temperature only if the body temperature is > 40°C, has not responded to antipyretics and the patient is uncomfortable. Moreover, the antipyretic drug must be given one hour before sponging or bathing so the hypothalamic set point will be lowered. If sponging or bathing is done before the antipyretic, the child becomes uncomfortable and shivers due to the hypothalamus attempts to offset the lowering of body temperature and it quickly returns to the previous level after sponging is discontinued\(^{(27)}\).

The international literature in treating fever is controversial. \(^{(30)}\)Keagle (1999) defined the febrile state as greater than 38.3°C\(^{(40)}\), Cunha others (1984) advised that only fevers greater than 38.9°C were significant \(^{(34)}\) and Lorin\(^{(31)}\) (1994) advocated treating only fevers a greater than 40°C\(^{(41)}\).

1.7. Antipyretic Drugs:

Zealous over prescription of antipyretics in children needs to be avoided with attention being redirected to the causes of the fever and the child’s capacity to cope with the illness. Overuse of antipyrelis can lead to delayed
prescription of antimicrobial drugs. Paracetamol (acetaminophen 10-15 mg/kg every 4-6 hourly and < 90 mg/kg/24/hours (2). It has been shown that 15 mg/kg is both a safe and a more effective dose than 10 mg/kg (42) and the dosage intervals have been recommended to be 4 hourly rather than 6 hourly, but no more than 5 doses in a 24-hour period. Although paracetamol appears to be a remarkably benign drug at therapeutic doses, liver toxicity with irreversible hepatic injury or acute hepatic failure has been reported in children given a single overdose (33) or multiple large doses (34). Paracetamol may cause renal injury in prolonged use (11). It is the preferable antipyretic worldwide.

It’s found in different forms syrups, suspensions, tablets and suppositories in different concentrations.

Because aspirin has been associated with Rye’s Syndrome in Children and adolescents, its use is not recommended for the treatment of fever. Other drugs are ibuprofen 5-10 mg/kg every 6-8 hours and mefanemic acid 6.5 mg/kg every 8 hours. Ibuprofen may cause dyspepsia, gastrointestinal bleeding, reduced renal blood flow, and rarely, aseptic meningitis, hepatic toxicity, or a plastic anaemia. Serious injury from ibuprofen overdose is unusual.
mefanemic acid may also cause gastrointestinal disturbances, peptic ulcer and bleeding. Headache, drowsiness, dizziness, nervousness and visual disturbances have also been reported \(^{(35)}\).

There may be hypersensitivity reactions including skin rashes, urticaria, allergic glomerunephritis is and it may precipitate asthma. All these drugs exert their antipyretic effects by blocking the cycle-oxygenase enzymes, thereby preventing the synthesis of prostaglandins from arachidonic acid\(^{(5)}\).

1.8. Temperature Measurement:

1.8.1. Sites of measuring temperature:

Although it’s not always necessary to take the temperature as part of the routine examination of children\(^{(4)}\), temperature recording is an important nursing action in fever management. Medical officers use these recordings to determine the nature of illness and observe children’s cardiovascular response to fever \(^{(28)}\). This is also essential both at home and hospital to decide if an antipyretics should be prescribed as well as considering risk of occult bacteremia. The height of the febrile response alone is not helpful in identifying a given disease or group of diseases\(^{(2)}\).
The gold standard is rectal temperature, because it’s the least affected by environmental temperature and it’s essential to be taken in neonates and small infants.

Axially measurement is the most easy and more or less reliable in children between the age of 3mo and 5 years. There is a mean difference of 0.5°C between rectal and axillary temperature. Oral temperature can be used reliably as long as the person is able to close his or her mouth and breath through his nose. It’s approximately 0.2°C-1°C lower than core temperature. Twenty to 30 minutes should be lapsed before taking oral temperature if there had been ingestion of hot or cold liquids or foods. It can be used in children above 5 years old.

1.8.2. Types and Methods of Temperature Taking.

There are many kinds of thermometers:

- Glass thermometers with mercury. These are the gold standard and most accurate. These can be oral, rectal or axillary.
- Digital thermometers run on batteries. They are good, work in less than 30 sec. Unless batteries are not good. They can be oral, rectal or axillary.

- Temperature strips go on the forehead. They are easy to use, but are not reliable\(^\text{(36,37)}\).

- Chemical – dot strips are good. But they need to stay next to the tongue for 60 seconds.

- Ear thermometers or tympanic, work in 2 seconds or less. They are expensive and are not useful. When compared with other types, it was found that it’s less accurate if there was prior ear surgery and contraindicated if there is acute or chronic inflammation of external ear canal or if there is bloody or purulent discharge\(^\text{(38,39,40)}\).

**1.8.3.Temperature Degrees:**

They are centigrade or Celsius and Fahrenheit. Centigrade is a more rational system of temperature measurement than Fahrenheit. It takes the freezing point of water as zero degrees and the boiling point as 100 dividing the interval into 100 parts.
Fahrenheit takes the freezing point to be 32 degrees, and the boiling point as 212 dividing the interval into 180 parts.

1.9. Fever Phobia:

Parents of febrile children often worry about fever and tend to regard it with more concern than physicians. Parental misconceptions often lead to unnecessarily aggressive and inappropriate management of fever in their children. Parent’s unfounded concern and misconceptions regarding the potential harmful effects of fever have given rise to the term “fever phobia”. It’s defined as the undue parental fear of fever. It’s suggested that pediatricians may contribute to parental misconception about fever \(^{(19)}\). It was confirmed that similar exaggerated fears are present among parents of all socioeconomic classes \(^{(3)}\). An understanding of what worries parents about fever in their children is important if these anxieties are to be dealt with effectively and if useful information and education are to be offered \(^{(41)}\). The beliefs and behaviors of parents regarding the management of acutely febrile children, have been described, but these aspects have been evaluated in the 1980s mainly in size-limited North American populations. Little studies done in Europe and Arabian population. These studies aimed to assess the understanding and management of fever,
attitude, sources of information about antipyretic drugs, beliefs of causes and effects of different treatments for fever\textsuperscript{(6)}. They found that 16% of parents believe that fever can rise to 43.3°C or higher, 56% give antipyretic at < 38°C, 21% begin sponging at < 38.5°C and 46% believe the most harmful effect of fever is brain damage. \textsuperscript{(24)}. Kaposi in 1980 found that 53% know that overdose of aspirin can be lethal, 37% asked the doctor for dosage instructions and for that 75% consult the label \textsuperscript{(3,19,42,43,44)}.

Parents perceive fever as being dangerous. They have a poor knowledge and measure it inaccurately. Needless consultations and hospital admission could be avoided by a change in perception \textsuperscript{(45)}. It was found also that the commonest cause that let parents give their children antibiotics without consultation, was fever (34%) \textsuperscript{(46)}. Parental educational programs on fever have been proposed and do help counteract parental fever phobia by reducing antipyretic misuse and in appropriate calls to the physician \textsuperscript{(47)}.

Clinical experience suggests that pediatrician may impart mixed messages to parents about the dangers of fever. For example, although many physicians agree that treatment to reduce fever is mostly for the comfort of the child, during telephone
consultations, many tend to prescribe antipyretic medication for any child with a fever. Beliefs and practices of doctors, how and when they tend to educate parents about fever, all have been studied\textsuperscript{(19)}. A significant number of the physicians have demonstrated a serious lack of knowledge about the nature, dangers and management of an extremely common health problem. They differ substantially in their knowledge of, attitude toward fever in children which is perhaps attributed to their different background in medical education and clinical training \textsuperscript{(48)}. Pediatric nurses are the mainstay in pediatric wards. They manage fevers in hospitalized children daily. Various decision-making criteria and inconsistent practice were identified. They perform comprehensive assessments in order to make informed decisions. Factors influencing their practice include medical orders, the temperament of the child, a history of febrile convulsions, parental requests, colleagues and ward norms. Nurses have a temperature at which they consider a child febrile and many reported a temperature at which they administer antipyretic. Antipyretics were administered to febrile children for pain relief, irritability, at the request of parents and to settle a child for the night. Administration was reported to be higher during the day and evening shifts, at medication rounds and when the ward was busy. At night, nurses
were reluctant to wake a sleeping febrile child, preferring to observe them instead\(^{(28)}\).

There are few available studies on contemporary parental knowledge and management of fever in children compared to medical personnel. Parents and physicians show fundamental value differences concerning diagnostic testing and error and short and long-term morbidity.

Also, fear of brain damage (for example) was noted in almost twice as many nurses as physicians and in three times as many parents as physicians\(^{(49)}\). This suggests that a better understanding of this issue may point up areas requiring improved education.

**JUSTIFICATION:**

1. Fever during childhood is a very common problem, the causes of which are really diverse and numerous. However, in Sudanese children it has not been studied before.

2. Attitude and practices of mothers towards febrile children was one of the research priorities of ministry of health since 2000.
OBJECTIVES:

1. To determine the possible causes of fever in children under five years using a simple approach.
2. To assess knowledge, attitude and practices of parents, doctors and other medical staff members in managing Febrile children.

Materials and Methods

2.1. Study design: This study is an observational descriptive hospital-based study.

2.2. Study Duration: The data of the study were collected during the months of June, July and August 2003.

2.3. Study Area: It was conducted in the pediatric casualties and wards in Khartoum Emergency Children’s Hospital, Omdurman Pediatric Hospital, Ahmed Gasim
Pediatric Hospital, Khartoum North Teaching Hospital
and some private clinics in Khartoum State.

2.4. **Case Definition:** Any male or female child between the age of
3 months and 5 years, whose axillary temperature was >
37.5°C with a duration of less than 7 days, was included in this
study.

2.5. **Sample size:** The calculation of the number of children was
based on the prevalence of fever in children presenting to the
outpatient clinic. According to a study in Australia during the 12
months of 1998, it was found that between 20-30% of all
children's visit were for acute episodes of fever. In another
study in Italy, fever was a common finding in 13% of pre-
school children.

Calculation was done by the following equation:

\[
N = \frac{Z^2 \times p \times q}{d^2}
\]

Where \( Z \) = statistical certainty at 95% level of confidence = 1.96.

\( P \) = Probability of success = 25% (average).

\( q = \) probability of failure = 75% = (1-P)

\( d \) = desired margin of error = 0.05.
N = number of children.

So 284 children were selected.

Also 284 mothers of the same children were included.

Calculation of number of health personnel (doctor nurses and sisters) was done using the following equation:

\[ n = \frac{Z^2 \times p \times q \times N}{d^2(N-1) + Z^2 \times pq} \]

Where \( Z = 1.96 \).

\[ (P = \text{was put 50\% because the studies done before had shown different ranges of knowledge about fever}). \]

\[ q = 50\% \]

\[ d = 5\% \]

\[ N = \text{total number of doctors, sisters and registered nurses taking care of children in the study area, and it was found to be 638.} \]

So \( n = \text{number of selected staff} = 240. \)

**2.6. Selection of patients mothers and medical staff:**

Children and their mothers were selected by non-probability sampling for convenience.

The researcher was not restricted by any time or day for sampling.

Doctors, sisters and nurses were selected by simple random sampling. The lists were brought for the medical directors, head nurses and metrons, and those who were chosen were verbally
informed with the study and its aims, and their consent was therefore taken.

The number of each category of the staff was calculated according to their percentage and distribution in the study area. For example as nurses constituted 46% of the staff selected,

About 40 mothers who were highly University graduates coming to private clinics having one or more children under the age of 5 years, presenting for any medical reason, were selected by non probability sampling. Most of them were employees.

2.7. Study technique and tools:

2.7.1. Patient’s questionnaire:

The questionnaire of the patient contained demographic questions (personal history), fever duration in days, associated symptoms, past history of febrile convulsions, chronic illnesses, history of recent vaccination and physical examination. The most important was the general look of the patient, level of consciousness and temperature recording in °C. Also chest and throat examination was done for almost all children and ear examination was done for some of them using a non-pneumonic otoscope(appendix ).
2.7.2. Categorizing patient:

If the etiology of the fever was apparent after a careful history and physical examination, the patient was categorized as febrile with a source or localizing focus. Some of the patients were febrile with skin rash, and those were also put in a separate category. When the etiology of child’s fever was not apparent the patient is categorized as fever without source.

2.7.3. Management of the children:

2.7.3.1. Laboratory investigations:

Most of the specimens were examined by the head technician of the laboratory of (KCEH) and the following was done.

2.7.3.1.1. Blood film for malaria:

Using a disposable lancet, two drops of blood (2-3mm) were placed in a clean slide and a thick film was done from one and a thin film done from the other using wedge method. Geumsa’s stain was used.\(^{(50)}\)
2.7.3.1.2. Urine analysis:

Two mls of urine were centrifuged for deposits. This was taken into a slide, covered with a cover glass and examined under the microscope for pus cells, red blood cells and casts.

2.7.3.1.3. Stool analysis:

It was done by diluting the stool in a slide with normal saline and covered with a cover glass looking for parasites, pus and blood cells.

2.7.3.1.4. Total white blood cell and differential count:

Two mls of blood were obtained from a peripheral vein by a disposable plastic syringe, added into a bottle containing potassium EDTA and examined. From this sample a thin film was done fixed by ethanol, then stained with Lieshman’s stain.

2.7.3.2. Investigation done when indicated:

- Erythrocytes Sedimentation Rate (ESR).
  
  It was done for specific patients by the Westergren method and read in 1 hour in mm/hr.

- Cerebrospinal fluid analysis,

- Chest x-ray
2.7.3.3. Diagnosis of the patients and medication:

All children were provisionally diagnosed according to clinical and laboratory results, then treated as outpatients. Some of the children were very ill or dehydrated. They were admitted in the corresponding units and managed by the doctors of the units.

2.7.4. Technique of Temperature Measurement:

Axillary temperatures were taken from all children included in the study using digital thermometer with Celsius reading. Axillary temperature is the most suitable for the age group of the study population and it can detect 97-100% of children with high rectal temperatures. The thermometer used in the study was CE 0197 DT—OIC, its reading ranges between 32.0°C to 41.0°C with accuracy of ± 0.1°C between 35° and 39°C, and ± 0.2°C under 35° or over 39°C. It reads in about 2 minutes.

Firstly, it was cleaned by alcohol before putting it to any child, placed well in the armpit with the help of the mother.

Mild elevations of temperatures can be caused commonly by warm or heavy clothing, if this was found, the mothers were asked
to lighten clothes or even remove them, and temperature is re-measured again after 15-30 minutes.

2.7.5. **Doctors, Mothers and Nurses Questionnaire:**

The questionnaire used in the study was based on current knowledge and recommendations concerning management of febrile children under the age of 5 years. The content of the questionnaire was similar for mothers, doctors and nurses but the terminology was adapted to each study group. All questions were pertained only to children older than 3 months, to avoid bias of possible prenatal events.

The questionnaire for mothers and that for nurses were in Arabic while that of the doctors was in English. They were reviewed by a social researcher, (Faculty of Medicine, U of K., Department of Community medicine), who had a long experience in studies aiming to asses knowledge, attitudes and practices. Then the questionnaires, were pretested for reliability and were designed for ease of administration and statistical analysis.

*The following issues were addressed:*

2. 7.5.1. **Knowledge:**

- Doctors were asked about the pathophysiology of fever.
- Benefit / danger of fever.
• Need to treat children without other symptoms of illness.

• Cut-off level of fever.

• Indication of antipyretic therapy.
  • Temperature level at which children need to receive antipyretic medication.
  • Knowledge about temperature measurement and types of thermometers.

• Doctors and nurses completed items on work status, age and years since graduation.

2.7.5.2. Attitudes:

Treatment of fever at home before seeking medical advice.

• Methods of treating fever.

• Methods to calculate antipyretic.

• Tendency of doctors and nurses to prescribe drugs or sponging.

• Tendency of doctors, mothers or nurses to measure temperature before treat it.

2.7.5.3. Practice:

• The way of doing sponging.

• The way of measuring temperature and site they prefer.
• The time doctors and nurses try to advice mothers about fever and ask them about home management.

The questions for mothers contained options for answers, so it was easy to match their words to those options and also to select the answer in those filled by the graduated mothers.

The questions for health personnel (doctors, nurses and sisters), were open-ended to avoid leading questions and bias. This is because they are key informants, and must not be helped to answer.

Part of the study was observational. Every nurse and sister was asked to measure the auxiliary temperature of a child in the ward and his or her way of doing that was assessed. The was obtained by asking to use disinfectant, reading temperature before putting it to the child (Checking the mercury, as only a glass thermometer was used for this purpose), then the time the thermometer is put in the armpit and the accuracy of the reading.

Also a check list was constructed for each ward and causality room to check the presence of thermometers and the conditions in which they found.
2.8. Statistical Analysis:

All data were coded to facilitate analysis. Then, using personal computer it was entered as a master sheet and the SPSS system was used for management of the data. Chi-square of Fisher’s exact test were used. Shared variables between the three groups were compared with a t-test. A two-tailed P-value of 0.05 was used to define statistical significance for differences between groups and to calculate confidence intervals around differences in sample means odds ratios.
3. RESULTS

3.1. Patients Results:

Figure (1) shows that from the 268 acutely febrile children included in the study, 113 (42%) were between the age of 3-12 month, 128 (47.8%) between 13-36 months and 27 (10.0%) were between 37-59 months. Figure (2) show that males were more than females, they were 152 (56.7%) while females were 116 (43.3%).

The most common symptoms were cough and runny nose in 178 (66.4%) and 171 (63.8%) respectively. Convulsions were the presenting symptoms of 7 children (2.6%) and 14 (5.2%) had past history of febrile convulsions.

Figure [3] shows that more than half of the children, 142 (53%), had low grade fever (37.5-38.4°C), 64 (23.9%) with temperatures between 38.5-39°C, more or less an equal number had temperatures more than 39°C. Only 3 children had a temperature of > 40°C. The heights was 40.2°C.

Table (1) Shows that most of the children 230 (85.8%) presented with a localizing symptoms or sings with his/her fever leading to determine a possible diagnosis. A small proportion had no focus 29 (10.8%) and only 9 (03.4%) of the children had fever
either with erythematous, pustular, macular or maculo-papular skin rash.

Figure (4) show that the most common causes of fever were respiratory infections 165(61.6%) including upper and lower tracts. Malaria was assumed in 42(15.7%) while 19(07.1%) children presented with diarrhoeal diseases (dysentery, gastroenteritis) and similar percentage were a group of different diseases like impetigo, abscess and osteomyelitis, meningitis, dehydration and occult bacterial or viral infections. Ten children (03.7%) had otitis media, 7(02.6%) were clinically diagnosed as having measles and only 6(02.2%) had urinary tract infections.

Fig (5) show that malaria was diagnosed in more than half of the patients without focus of infection 15(51.7%), occult bacterial infections were assumed in 6(20.7%), viral infections in 5(17.2%) and 3 children (10.4%) were diagnosed as having urinary tract infections.

Table (2) shows that there was significant correlation between the general condition of the children and duration of fever ($p = 0.011$). The number of well-looking children were more in those of fever of 1-3 days 131(62.1%) than in those who were febrile for more than 4 days 24(42.1%)
Table (3) shows that 19 children of those presented without a focus (65.5%) were between 3-12 months in comparison with those between 13-36 months 10(34.5%), while no child between 37-59 months came without a focus of infection. It was difficult to identify a focus of infection in young infants.

3.2 Mothers Knowledge & Attitudes:

3.2.1 The interviewed sample:

Fig 6 show that most of the mothers were between 20-40 years of age 256(87.7%), two thirds had only Quran or primary schooling and only 52(17.8%) were University graduates or postgraduates. About half of the mothers had only one child under 5 years of age 140(47.9%), the other had two or more children 152 (52.1%).

3.2.2. Mother’s knowledge:

Mother’s knowledge was tested by asking a variety of questions about definition, danger and causes of fever. They were also asked about types of thermometers, temperature degrees and antipyretic drugs and their side effects. There was highly significant correlation between mother’s knowledge and
educational level. Table (4) shows that, only a small proportion of illiterate 2(02.5%), 4(03.9%) of those had Quran or primary schooling and 7(12.1%) of mothers with secondary schooling, can define fever as elevated temperature of more than 37-38°C. More than half of university graduate and post graduate mothers are aware of this 31(59.6%).

Table (4) showed that most of the mothers think that fever is dangerous and not beneficial 289(99%) and convulsions were the main danger of fever in one third of illiterate mothers 25(31.6%) compared to 41(78.8%) of highly educated mothers. Thirty seven illiterate mothers (46.8%) thought that anaemia and paralysis were related to fever while only 2 of the highly educated mothers (3.9%) thought so, the difference is statistically significant  P = 0.000).

Most of the mothers thought that diseases and infections are the most common causes of fever, correlating significant with the level of education, a fact stated by 48of the illiterate mothers (60.8%) and 47of highly educated ones (90.4%). Trauma, sun heat and vaccination were mentioned more by illiterate mothers 22(27.8%) than other groups (P = 0.003).

Table (5) shows the following: when asked about the temperature degree, most of the illiterate 78(98.7%) and 99(96.1%) of those with either Quran or primary schooling, did
not know any type of a temperature grading. About 19 of those with secondary school education (32.8%) knows Celsius, Fahrenheit or both and 48 of highly educated mother (92.3%) do so, the difference is statistically significant. (P = 0.000).

Knowledge of mothers about side effects of antipyretics correlates also with their level of education. A small proportion of illiterate mothers 4 (05.1%) know at least one side effect for either paracetamol or aspirin while a higher proportion of highly educated mother do so 23 (44.2%).

Table (6) shows the relation of mother's knowledge about sites of temperature measurement to education. It's clear that a high proportion 64 of illiterate mothers (81.0%) don't know any site of measuring temperature, compared with only 2 of highly educated mothers (03.8%). Axillary’s temperature measurement is known by 11 of highly educated mothers (21.2%) and 22 of those who had Quran or primary schooling (20.6%). It's less known by illiterate 9 (11.4%) and secondary school graduates 5 (8.6%). Few mothers 3 (1%) know rectal measuring of temperature. The differences are statistically significant (P = 0.000).

Table (7) shows that knowledge of mothers about sites of temperature measurement correlates also with their ages. The oral site was known by more than half of the mothers > 40 years
old 17(57.9%) , but only 2(11.8%) of mothers younger than 20 years. Also axillary site is known by 5 mothers younger than 20 years (29.4%) compared to 3 mothers > 40 years (10.5%). The difference is statistically significant (P = 0.029).

3.2.3. Attitude of mothers:

Figure (7) shows that attitude of mothers towards fever correlates with their number of children below 5 years and also with their educational level. As 77 of the mothers who had one child below 5 years (50.7%) go immediately in the same day to the doctor, less proportion do so from mothers with more than one child 53(34.9%). Moreover one third of the later 46(30.2%) may wait 3-7 day before going to doctor compared to 27 mothers with one child (19.3%).

Tepid or warm water is used for sponging in 45 of mothers with one child (32.1%) and it is less used in those with more children 38(25.0%).

Table (8) showed that most of the mothers know and use paracetamol to treat fever 242(82.9%). Aspirin is used more by illiterate 14(17.7%) than secondary schools educated mothers 3(5.8%). Mothers mostly follow doctor’s instructions regarding the doses of antipyretic drugs. While 30 of mothers with secondary
schools education (57.7%) used to self determine the doses, 8 of illiterate mothers (10.1%) and 9 of primary schools graduates (8.7%) do so. None of the highly educated mothers tend to self-determine the dose for her child.

3.2.4. Mothers practices.

In table (9) traditional and harmful practices of mothers in Sudan and their relation to educational level were observed. Two thirds 193 (66.1%) uses cold or ice water for sponging, one third 95 (32.9%) do start treatment with sponging rather than drugs, 36 (12.4%) commonly use aspirin as the first line of their management. Moreover, a high proportion 209 (71.6%) self-determine or follow drug instructions in dosing of paracetamol with or without chloroquine. Mothers who are Quran or primary educated are practicing these means more than others. The difference between them is statistically significant (P=0.000).

Table (10) shows the traditional methods that are preferred and used by mothers. A small percentage 9 (3.1%) do use them. Two thirds 6 (66.7%) of those who uses traditional means are illiterate and one third have Quran or primary schooling. The difference between them is not statistically significant. The traditional methods were covering of skin surface with sesame oil, some
may add garad or kamoon or tea. Others may use lubkha, dukhan cauterization, scarring and uvula removal especially for prolonged fever.

3.3.3 Doctors Knowledge and attitudes:

3.3.3.1. Sample characteristics:

108 questionnaires for doctors were distributed and 75(69%) returned the questionnaires, as shown in fig (8) more than half of them were house officers 41(54.6%), half of the rest were medical officers and the other was registrars 17(22.7%). Most of the doctors had practiced medicine for less than 5 years 64(85.4%)

About two thirds 47(62.7%) of the doctors had a training course on temperature measurement in his undergraduate course included in either preclinical, clinical or both courses. Twenty eight (37.3%) has no training courses before.
3.3.3.2. Doctors knowledge:

Knowledge of doctors about fever differ between doctors grades. Table (9) show that knowledge about temperature regulation centre and how it’s informed about fever was better in registrars and house-officers 13(31.7%) and 12(70.6%) respectively than medical officer 4(23.6%). The difference is statistically significant between house-officers and registrars and between registrars and medical officers (P = 0.008). It not significant between house-officers and medical officer.

In Fig (9), it was found also that knowledge about endogenous pyrogens was better in medical officers and registrars than house officers. The difference is statistically significant between house-officers and registrars and between registrars and medical officers (P = 0.008). It is not significant between house-officers and medical officer.

Table (11) shows that knowledge about cut-off level of fever in children was better in registrars 10(58.8%) than in house officers and medical officers 10(24.40%) and 31(17.6%) respectively. The difference is statistically significant between the three groups (P =0.000).

Table (12) shows that high proportion of registrars 15(88.2%) treat fever mainly to prevent convulsions in
comparison with 28 of house-officers(70.0%) and 12 of the medical officers(70.6%), the difference is statistically significant between the three groups (P<0.000).

Doctors were asked about common causes of fever. The majority had mentioned respiratory tract infections and malaria without considering viral infections. Only 1(2.4%) house-officer and 4(23.4%) registrars mentioned viral infections. The difference is not statistically significant between the three groups.

Their knowledge to different paracetamol forms and concentrations differs between the three groups. Table (12) shows that 6 of registrars (36.3%) were sure of different concentrations while 6 of house offices (14.6%) and 5 of medical officers (29.4%) do so, the difference is not statistically significant between the three groups.

3.3.3.3. Doctors attitude:

It was also found that attitude towards fever may correlate with the doctor grade. Fig (10) shows that house officers 27(62.5%) and no medical officer tends to advise good home management for febrile convulsions at home while, 7(41.2%) registrars do so. Also 9(52.9%) of the registrars tends to use non-pharmacological means to treat the fever in
comparison with less proportion in house officers 6(14.6%) and medical officers 3(17.6%) the difference is not statistically significant between the three groups.

Doctors council mothers about fever management, and they were asked about dangerous practices done by mothers in Sudan. Table (13) showed that the most common practices which could be identified were overdressing, applying oil on the baby and other traditional materials, abuse of antipyretic drugs e.g. aspirin or wrong dosing and the use of cold or even ice for doing sponging.

3.4. Nurses knowledge and practice:

3.4.1. Sample characteristics:

From the 132 sisters and nurses selected only 9 didn’t return the questionnaires with compliance rate of (93.2%). More than half of them were between the age of 20-30 years 66(53.7%) and the others 57(46.3%) were more than 30 years. About two thirds of them were registered for less than 10 years 75 (61%) and one third for 10-20 years 48(39%).

Table (14) shows there was some correlation between some aspects of their knowledge about fever and their age. Thirty eight of he nurses (57.6%) who were between the age
of 20-30 years thought that fever is beneficial while less number 22 thought the same in the group of >30yrs of age (38.6%). All nurses could identify glass thermometers. Younger nurses were able to identify digital and dot strip types of thermometers more than senior nurses, 29(43.9%) and 9(15.8%) receptively (P value is 0.000).

Table (15) shows that one third of younger nurses (43.8%) read temperatures with a glass thermometer (axillary) in a correct time (4-5min) compared with (12.3%) of those who are more than 30 years. (P = 0.004).

3.5.Comparison between the three study groups in knowledge and attitude:

A total of 490 questionnaires were evaluated and analyzed. Compliance rate was (100%) for mother’s (69%) for doctors and (93%) for nurses. The responses of the three groups to the main study questions are compared in Fig (11).

3.5.1. Difference in knowledge:

Fever is considered as a benefit for the child by 55(66.7%) of doctors (66.7%), 60 of the nurses (48.8%) and only 3 (1%) of the mothers. Doctors stated that it’s beneficial either because it alarms parents for the presence of a disease or because it
stimulates the immune system. The difference is statistically significant between the three groups (P = 0.000). Sponging is indicated only after antipyretic, if the temperature is > 40°C and if the child is fitting by 166 of the mothers (56.8%), 21 of doctors (28.0%) and 109 of nurses (88.6%). The difference is statistically significant between them. (P = 0.000).

Table (16) shows that more than half of the mothers 153 (52.4%), 55 of the doctors (73.3%) and 78 of the nurses (63.4%), think that preventing febrile convulsions is the main cause to treat fever; the difference is statistically significant between them. (P = 0.000). It was also found that 176 of mothers (60.3%) tends to treat fever of low grade in comparison with 33 of doctors (44.0%) and 46 of the nurses (37.4%). The difference between the three groups is highly significant (P = 0.000).

3.5.2. Difference in attitude:

Fig (12) shows that more than half of the nurses 70 (56.9%) use tepid or warm water for sponging, while 21 of the doctors (28%) and 83 of the mothers (28.4%) do that. The difference between the three groups is statistically significant (P = 0.000). The use of natural and non-pharmacological
means other than sponging to treat fever e.g. lightening of
clothes, extra fluids, cold drinks or fans, are used by doctors
24(32.6%) more than by nurses 34(27.6%) and mothers
10(3.4%). The difference between the three groups is
statistically significant. (P = 0.000).

Doctors and nurses were asked if they awake the febrile
child in the ward to give medication for his fever. More than
half of the doctors 44(58.7%) do awake the sleeping child
without other signs of illness and less proportion of nurses
can do that 55(44.7%). The difference between them is
statistically significant. P =0.000.

Paracetamol or acetaminophen is the most common
antipyretic used by 75(100%) of doctors, 112(91.0%) of the
nurses and 241 (82.2%) of the mothers, the difference between
them is statistically significant (P =0.00).

Many aspects of knowledge and attitude were not
significantly related to factors like educational level, age,
children’s number or, doctors grade or work duration and are
not mentioned in details.
3.6 Check List Results:

The number of wards and casualty rooms in the study area was 46. In only 18 facilities, one thermometer is available per one facility.

Most of the thermometers were ordinary glass and found in a good condition, put in a fresh diluent in only 5 facilities (10.9%) as daily practice for nurses and doctors.
Table (1) Presence of local focus in children in the study group.

<table>
<thead>
<tr>
<th>Category</th>
<th>No</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever with focus</td>
<td>230</td>
<td>(85.08%)</td>
</tr>
<tr>
<td>Fever without focus</td>
<td>029</td>
<td>(10.08%)</td>
</tr>
<tr>
<td>Fevers with skin rash</td>
<td>009</td>
<td>(03.04%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>268</td>
<td>(100.0%)</td>
</tr>
</tbody>
</table>

Table (2) Relation of the general condition of the child to the duration of fever. (N= 268)

<table>
<thead>
<tr>
<th>Fever duration in days</th>
<th>Well-looking No (%)</th>
<th>Ill-looking No (%)</th>
<th>Severely ill No (%)</th>
<th>Total No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>131 (62.1%)</td>
<td>077 (36.5%)</td>
<td>03 (01.4%)</td>
<td>211 (78.7%)</td>
</tr>
<tr>
<td>4-6</td>
<td>024 (42.1%)</td>
<td>30 (52.6%)</td>
<td>03 (05.3%)</td>
<td>057 (21.3%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>155 (57.8%)</td>
<td>107 (39.9%)</td>
<td>06 (02.3%)</td>
<td>268 (100.0%)</td>
</tr>
</tbody>
</table>

P.value = 0.011
Table (3) Presence of focus infection in relation to child age group. (N=263)

<table>
<thead>
<tr>
<th>Age Months</th>
<th>3-12 N0 (%)</th>
<th>13-36 N0 (%)</th>
<th>37-59 N0 (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Febrile without focus</td>
<td>19 (65.5%)</td>
<td>10 (34.5%)</td>
<td>-</td>
<td>239 (100%)</td>
</tr>
<tr>
<td>Febrile with focus</td>
<td>93 (39.0%)</td>
<td>118 (49.4%)</td>
<td>28 (11.6%)</td>
<td>29 (100%)</td>
</tr>
</tbody>
</table>

P.value =0.011
Table (4) Relation of mother knowledge about fever to educational level (N=292)

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Illiterate No (%)</th>
<th>Quran or primary No (%)</th>
<th>Secondary No (%)</th>
<th>Gradu./postgr No (%)</th>
<th>p.value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fever definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp&gt;37°C</td>
<td>02 (02.5%)</td>
<td>04 (03.9%)</td>
<td>07 (12.1%)</td>
<td>31 (59.6%)</td>
<td></td>
</tr>
<tr>
<td>Elevated body temperature</td>
<td>20 (25.3%)</td>
<td>31 (30.1%)</td>
<td>29 (50.0%)</td>
<td>18 (34.6%)</td>
<td></td>
</tr>
<tr>
<td>Hotness of body</td>
<td>57 (72.2%)</td>
<td>68 (66.0%)</td>
<td>21 (37.9%)</td>
<td>03 (05.8%)</td>
<td>0.000</td>
</tr>
<tr>
<td>2. Main danger of fever:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>16 (20.3%)</td>
<td>13 (12.6%)</td>
<td>18 (310%)</td>
<td>06 (11.5%)</td>
<td></td>
</tr>
<tr>
<td>Convulsions</td>
<td>25 (31.6%)</td>
<td>50 (48.5%)</td>
<td>25 (43.1%)</td>
<td>41 (78.8%)</td>
<td></td>
</tr>
<tr>
<td>Dehydration</td>
<td>01 (1.3%)</td>
<td>03 (02.9%)</td>
<td>01 (01.7%)</td>
<td>03 (05.8%)</td>
<td></td>
</tr>
<tr>
<td>Others:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paralysis, anaemia, weight loss</td>
<td>37 (46.8%)</td>
<td>37 (36.0%)</td>
<td>14 (24.2%)</td>
<td>02 (03.9%)</td>
<td>0.000</td>
</tr>
<tr>
<td>3. Causes of fever:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diseases/infection</td>
<td>48 (60.8%)</td>
<td>74 (71.8%)</td>
<td>50 (86.2%)</td>
<td>47 (90.4%)</td>
<td></td>
</tr>
<tr>
<td>Teething</td>
<td>09 (11.4%)</td>
<td>12 (11.7%)</td>
<td>04 (06.9%)</td>
<td>03 (05.8%)</td>
<td></td>
</tr>
<tr>
<td>Others: trauma, sun heat, vaccination</td>
<td>22 (27.8%)</td>
<td>17 (16.5%)</td>
<td>4 (06.9%)</td>
<td>02 (03.8%)</td>
<td></td>
</tr>
</tbody>
</table>
Table (5) Relation of mother knowledge about fever to educational level (N=292)

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Illiterate No (%)</th>
<th>Quran /primary No (%)</th>
<th>Secondary No (%)</th>
<th>Gradu./postgr No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature degree</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Celcius</td>
<td>-</td>
<td>-</td>
<td>11 (19.0%)</td>
<td>17 (32.7%)</td>
</tr>
<tr>
<td>Fahrenheit</td>
<td>-</td>
<td>-</td>
<td>02 (03.4%)</td>
<td>14 (26.9%)</td>
</tr>
<tr>
<td>Both</td>
<td>01 (01.3%)</td>
<td>04 (03.9%)</td>
<td>06 (10.3%)</td>
<td>17 (32.7%)</td>
</tr>
<tr>
<td>Don't know</td>
<td>78 (98.7%)</td>
<td>99 (96.1%)</td>
<td>39 (67.2%)</td>
<td>04 (07.7%)</td>
</tr>
</tbody>
</table>

N= 292
Side effects of antipyretics

Know at least one for either paracetamol or aspirin

Don’t know

<table>
<thead>
<tr>
<th></th>
<th>Oral</th>
<th>Rectal</th>
<th>Axillary</th>
<th>Groin</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational level</td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>Illiterate</td>
<td>06 (07.6%)</td>
<td>-</td>
<td>09 (11.4%)</td>
<td>-</td>
<td>64 (81.0%)</td>
<td>79 (100.0%)</td>
</tr>
</tbody>
</table>

P.value 0.000
<table>
<thead>
<tr>
<th>Education Level</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary or Quran</td>
<td>29</td>
<td>28.4%</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>01.0%</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>20.6%</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>03.4%</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>50.0%</td>
</tr>
<tr>
<td></td>
<td>103</td>
<td>100.0%</td>
</tr>
<tr>
<td>Secondary</td>
<td>34</td>
<td>58.6%</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>03.4%</td>
</tr>
<tr>
<td></td>
<td>05</td>
<td>08.6%</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>25.9%</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>100.0%</td>
</tr>
<tr>
<td>Graduate or post</td>
<td>39</td>
<td>75.0%</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>21.2%</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>03.8%</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

P.value = 0.000
## Table (7) Relation of mother knowledge about sites of temperature measurement to the age of the mother (N=292)

<table>
<thead>
<tr>
<th>Age groups/ys</th>
<th>Oral No (%)</th>
<th>Rectal No (%)</th>
<th>Axillary No (%)</th>
<th>Groin No (%)</th>
<th>Don’t know No (%)</th>
<th>Total No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>02 (11.8%)</td>
<td>-</td>
<td>05 (29.4%)</td>
<td>-</td>
<td>10 (58.8%)</td>
<td>17 (100.0%)</td>
</tr>
<tr>
<td>20-30</td>
<td>37 (28.7%)</td>
<td>02 (01.6%)</td>
<td>27 (20.9%)</td>
<td>02 (01.6%)</td>
<td>61 (47.3%)</td>
<td>129 (100.0%)</td>
</tr>
<tr>
<td>31-40</td>
<td>58 (46.0%)</td>
<td>07 (00.8%)</td>
<td>12 (9.5%)</td>
<td>-</td>
<td>55 (43.7%)</td>
<td>126 (100.0%)</td>
</tr>
<tr>
<td>&gt;40</td>
<td>17 (57.9%)</td>
<td>-</td>
<td>03 (10.5)</td>
<td>-</td>
<td>06 (31.6%)</td>
<td>20 (100.0%)</td>
</tr>
</tbody>
</table>

P.value = 0.029
Table (8) Relation of mother attitude towards fever to the educational level (N=292)

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Illiterate</th>
<th>Quran/ing</th>
<th>Secondary</th>
<th>Gradu./postgr</th>
<th>p.value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Use of home thermometers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>01 (01.3%)</td>
<td>01 (01.0%)</td>
<td>-</td>
<td>21 (40.4%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>78 (98.7%)</td>
<td>102 (99.0%)</td>
<td>58 (100.0%)</td>
<td>31 (59.6%)</td>
<td>0.000</td>
</tr>
<tr>
<td>2.Use of antipyretic drugs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paracetamol</td>
<td>57 (72.2%)</td>
<td>86 (83.5%)</td>
<td>51 (87.9%)</td>
<td>48 (92.3%)</td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>14 (17.7%)</td>
<td>15 (14.6%)</td>
<td>05 (08.6%)</td>
<td>03 (05.8%)</td>
<td></td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>01 (01.3%)</td>
<td>-</td>
<td>-</td>
<td>01 (01.9%)</td>
<td>0.033</td>
</tr>
<tr>
<td>Don’t know</td>
<td>07 (08.9%)</td>
<td>02 (1.9%)</td>
<td>02 (03.5%)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3- Dosing of antipyretic drugs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug instructions</td>
<td>03 (03.8%)</td>
<td>15 (14.6%)</td>
<td>28 (48.3%)</td>
<td>22 (42.3%)</td>
<td></td>
</tr>
<tr>
<td>Doctors instructions</td>
<td>68 (86.1%)</td>
<td>79 (76.7%)</td>
<td>29 (50.0%)</td>
<td>30 (57.7%)</td>
<td></td>
</tr>
<tr>
<td>Self- determination</td>
<td>08 (10.1%)</td>
<td>09 (08.7%)</td>
<td>01 (01.7%)</td>
<td>00 (00.0%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>79 (100.0%)</td>
<td>103 (100.0%)</td>
<td>58 (100.0%)</td>
<td>52 (100.0%)</td>
<td></td>
</tr>
<tr>
<td>Practice</td>
<td>Illiterate</td>
<td>Quran /primary</td>
<td>Secondary</td>
<td>Gradu./postgr</td>
<td>Total</td>
</tr>
<tr>
<td>----------------------------------------------------------------</td>
<td>------------</td>
<td>----------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>Traditional means*</td>
<td>06 (02.1%)</td>
<td>03 (01.0%)</td>
<td>-</td>
<td>-</td>
<td>09 (03.1%)</td>
</tr>
<tr>
<td>Ice/cold water for sponging</td>
<td>52 (17.8%)</td>
<td>78 (26.7%)</td>
<td>39 (13.4%)</td>
<td>24 (08.2%)</td>
<td>193 (66.1%)</td>
</tr>
<tr>
<td>Do sponging before antipyretics</td>
<td>21 (07.2%)</td>
<td>33 (11.3%)</td>
<td>14 (04.8%)</td>
<td>27 (09.2%)</td>
<td>95 (32.5%)</td>
</tr>
<tr>
<td>Use aspirin tablets</td>
<td>14 (04.8%)</td>
<td>15 (05.1%)</td>
<td>04 (01.4%)</td>
<td>03 (01.0%)</td>
<td>36 (12.3%)</td>
</tr>
<tr>
<td>Self-determine / follow drug instructions in dosing of antipyretic</td>
<td>11 (03.8%)</td>
<td>24 (08.2%)</td>
<td>29 (09.9%)</td>
<td>22 (07.5%)</td>
<td>86 (29.4%)</td>
</tr>
</tbody>
</table>

*Oiling of surface, oil with kamoon and garad, labkha, Cauterization, scaring and uvula removal in prolonged fever.*
Table (10) Relation of use of traditional means to treat fever to mothers education (N=9)

<table>
<thead>
<tr>
<th>Education</th>
<th>Oiling of skin surface with sesame oil garad or kamoon.</th>
<th>Lubkha, cauterization scarring and uvula removal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO (%)</td>
<td>NO (%)</td>
</tr>
<tr>
<td>Illiterate</td>
<td>03 (33.3%)</td>
<td>02 (22.2%)</td>
</tr>
<tr>
<td>Quran / primary</td>
<td>04 (44.5%)</td>
<td>-</td>
</tr>
<tr>
<td>Secondary</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Grad post grad | - | - | -

Table (11) Relation of knowledge of doctors about cut off level of fever and the main cause to treat fever to work grade.

<table>
<thead>
<tr>
<th>Question</th>
<th>HO (N=41)</th>
<th>MO (N=17)</th>
<th>Registrars (N=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No (%)</td>
<td>No (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>Axillary temp of 37.5°C / rectal of 38°C is the cut-off level of fever.</td>
<td>10 (24.4%)</td>
<td>03 (17.6%)</td>
<td>10 (58.8%)</td>
</tr>
</tbody>
</table>
Treat fever mainly to prevent convulsions

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>(70.0%)</td>
<td>(70.6%)</td>
<td>(88.2%)</td>
</tr>
</tbody>
</table>

P.value = (HO. Vs MO. )= 0.000       (HO Vs Registrars )= 0.000       (Registrars Vs MO.)= 0.000
Table (12) Relation of doctors knowledge about viral causes of fever and their awareness about paracetamol (forms and concentrations) to professional grade.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>HO (N=41)</th>
<th>MO (N=17)</th>
<th>Registrars (N=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No (%)</td>
<td>Yes</td>
</tr>
<tr>
<td>1. Viral causes of fever:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>01</td>
<td>(02.4%)</td>
<td>-</td>
</tr>
<tr>
<td>No</td>
<td>40</td>
<td>(97.6%)</td>
<td>17</td>
</tr>
<tr>
<td>2. Know different paracetamol forms and concentrations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>06</td>
<td>(14.6%)</td>
<td>05</td>
</tr>
<tr>
<td>No</td>
<td>35</td>
<td>(85.4%)</td>
<td>12</td>
</tr>
</tbody>
</table>
P.value = (HO. Vs MOS. = 0.349          (HO. Vs Registrars) = 0.3371296 (Registrars Vs MO.) = 0.04869600

Table (13) Harmful practices done by mothers regarding fever management mentioned by doctors.

<table>
<thead>
<tr>
<th>Practice</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional means (oiling, labkha, cauterization, uvula, removal, scarring, dukhan)</td>
<td>11</td>
</tr>
<tr>
<td>Over dressing</td>
<td>20</td>
</tr>
<tr>
<td>Decrease fluid intake</td>
<td>13</td>
</tr>
<tr>
<td>Abuse of drug (wrong drugs and doses, ...)</td>
<td>16</td>
</tr>
</tbody>
</table>
missed doses, self treatment)

Use of ice and cold water for sponging 14

Note: Not all doctors did mention a practice.
One doctor may mention more than one practice.

Table (14) Relation of nurses knowledge regarding fever and types of thermometers to their age.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Age of the nurse</th>
<th>p.value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20-&lt;30yrs No (%)</td>
<td>&gt; 30yrs No (%)</td>
</tr>
<tr>
<td>1.Fever may be beneficial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>10 (24.4%)</td>
<td>25 (40.9%)</td>
</tr>
<tr>
<td></td>
<td>0.049</td>
<td>0.049</td>
</tr>
</tbody>
</table>

2. Thermometers:

<table>
<thead>
<tr>
<th></th>
<th>Identify mercury and other types</th>
<th>Identify mercury only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>29 (43.9%)</td>
<td>35 (36.1%)</td>
</tr>
<tr>
<td></td>
<td>09 (15.8%)</td>
<td>48 (84.2%)</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table (15) Relation of Nurses practice regarding reading the temperature with axillary glass thermometer to age (N= 123).
<table>
<thead>
<tr>
<th>Age in years</th>
<th>Time take to read the temperature with axillary glass thermometer (4-5mints)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correct</td>
<td>Incorrect</td>
</tr>
<tr>
<td></td>
<td>No (% )</td>
<td>No (%)</td>
</tr>
<tr>
<td>20 - 30</td>
<td>23 (34.8%)</td>
<td>43 (65.2%)</td>
</tr>
<tr>
<td>&gt;30</td>
<td>07 (12.3%)</td>
<td>50 (87.7%)</td>
</tr>
</tbody>
</table>

P.value = 0.004

Table (16) Difference in knowledge about fever between mothers, nurses and doctors.

<table>
<thead>
<tr>
<th>Question</th>
<th>Mothers (N=292)</th>
<th>Doctor (N=75)</th>
<th>Nurses (N=123)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes No (%)</td>
<td>Yes No (%)</td>
<td>Yes No (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

xvi
Prevention of convulsion is the main cause to treat fever

<table>
<thead>
<tr>
<th></th>
<th>Mothers</th>
<th>Doctors</th>
<th>Nurses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention of convulsion is the main cause to treat fever</td>
<td>153 (52.4%)</td>
<td>55 (73.3%)</td>
<td>78 (63.4%)</td>
</tr>
<tr>
<td>Low grade fever needs treatment</td>
<td>176 (60.3%)</td>
<td>33 (44.0%)</td>
<td>46 (37.4%)</td>
</tr>
</tbody>
</table>

P.value = (Mothers Vs Doctors) = 0.000  (Mothers Vs Nurses) = 0.000  (Nurses Vs Doctors) = 0.000
**DISCUSSION**

In spite of that there are more than 300 studies since 1960 pertaining to the management of febrile children, no study have been done in Sudan. In this study, the aim of which was to determine possible causes of fever, all children were between 3 and 59 months of age. The majority were below 36 months 241 (89.9%) which supports the findings of other reports. This is because both minor and life-threatening infectious diseases, including respiratory infections, occult bacteremia and meningitis, are common in this age group (10). The most common symptoms were cough and runny nose which is similar to other studies (2,10).

About 77% of children in the study group had temperatures less than 39°C, not reaching the level which put them at high risk. This is similar to other studies in which the figure of 75% was reported and more than half of febrile children were reported in another study (5). The latter study was done in Australia in 1998 throughout the whole year. Others found 50% less than 38°C and only 9% more than 39°C (6).

In this study only 10.8% of children had fever without a focus, a low percentage in comparison with 14%, 20% and 30% mentioned in other reports (10, 11, 22).

Supporting old and new studies on fever, respiratory infections, including upper and lower tracts, were the most common causes of fever in this study.

Near to this was reported by a study in Italy where influenza was 44% and upper respiratory tract infections were 30% of the diagnoses of 707 children (6). Other studies have done microbiological tests to state the fact that viral infections are the most common causes of fever (2).

A clear difference between this study and others, is that malaria comprises more than half the percentage of causes in children without focus 15(51.7%), although malaria was only found in (15.7%) of children.

Most common causes of fever in this age group reported in other studies were urinary tract infections and viral fever (2), and malaria was found to be an uncommon cause of fever. Moreover, this does not exclude the presence of viral infections associated with malaria in this study, because viral studies were not included.

The statistically significant correlation between the general condition of the child and the duration of fever supports McCarthy (21) who
considered the duration of fever as a factor to evaluate the febrile child.

The beliefs and behavior of mothers regarding the management of fever affecting their children have been described in this study. Little information is available on home management of febrile children in a Sudanese setting. The difference in the findings in this study in comparison to previous investigations, lies in the fact that it was undertaken in a population whose social and cultural features are substantially different from those in America or Europe. The first fact is that all mothers there used to measure temperature of their febrile children before treatment even when they have asked for the doctor advise.

Mothers in our setting usually don’t have any type of thermometers at home. Moreover, this study is designed to evaluate the factors that may be associated with mothers concern about fever.

The potential limitations of this study should however, be considered. The study does not consider father’s knowledge and attitudes. This is because children in the study area are mostly brought by their mothers. This reflect that child care is largely the responsibility of mothers in Sudan.

Body temperature is one of the most common clinical signs used by the mothers to decide whether a child is ill. Parents often measure their child temperature before deciding about the management of fever and whether to seek professional advice. In this study only 23(07.9%) of the mothers do use thermometer at home. All of them have the digital type and they prefer the axillary site. In another area, mothers prefer also the axially site. There is still disagreement as to the optimal site for measuring temperature in children. The choice depends partly on the aim of the measurement; usually this is merely to establish the presence of fever and its approximate level. In our study, in spite of that knowledge about sites of temperature measurement is significantly related to educational level as well as age of the mother, a high proportion 132(45.2%) don't know any site for measurement of temperature. The oral route was known by more than one third of the mothers and one sixth knew the axillary site. Only 3 (4.4%) knew the rectal site and 2(0.7%) mentioned the groin. This is considered as poor knowledge about sites of temperature measurement. The rectal method is considered more reliable and sensitive than the axillary route and is therefore recommended when precision is required. However, some consider it inappropriate for mothers because of the risk of thermometer may be damaged, rectal injury and cross-infections. These complications, however, have been
overstressed and are too rare for rectal temperature measurement to be discouraged\(^{54}\).

In infants and children who are too young for oral temperatures, axillary measurement may provide a reasonable screening test. Axillary temperature is considerably sensitive in detecting fever in 93\% of those with rectal temperature of \(> 38^\circ C\) and in 100\% of those with \(>39^\circ C\) \(^{55}\).

Similar to other studies, educational level and number of children were the variables significantly associated with mothers knowledge and attitude. Another factor which was noted in this study was the age of the mothers. Residency in the south of Italy was found as a factor\(^{6}\). However, in this study, this doesn’t correlate with their knowledge and attitudes. This may be because the study area was Khartoum city although most of mothers were originally from different regions of the country. Although the age of the mother was not a factor which statistically related to knowledge in the study of Impicciatore\(^{6}\), most of the mothers were between 20-40 years (94.7\%) in comparison to this study where this age group was (87.8\%).

Also more than half of the mothers (52\%) in this study group had more than one child under 5 years of age, a less percentage (35.9\%) was reported in the study which was conducted in Italy\(^{6}\).

It appears that highly educated mothers are more oriented with striking events occurring with fever. This is reflected in the finding that (78.8\%) of highly educated mothers mentioned that convulsion is the main danger of fever in comparison with (31.6\%) of illiterate mothers. This may be for two reasons; not all mothers would have seen febrile convulsions, and that the more the educated the mother, the more correct the information reaches the mother. However, what should be added to their knowledge is that febrile convulsions, might not be the main danger of fever. The percentage of mothers who think that convulsions are the main danger is similar in this study (48.2\%) to the percentage found by Gribetz in his study in 1987 (48\%) \(^{44}\).

The same issue is observed in answering the question about causes of fever, when causes other than diseases were reported more by less educated mothers.

Side effects of an antipyretic agents either paracetamol or aspirin, such as liver damage and bleeding respectively, were known by only (12.7\%) of the total number of mothers compared with (89\%) for paracetamol and (53\%) for aspirin reported by Schmitt 1980 \(^{19}\).

Regarding the definition of fever, only (15\%) of mothers in this study could mention temperature in degrees in comparison with (100\%) of
mothers in other studies, where some defined it as rectal temperature $< 38^\circ C$ \cite{3,6,43}.

If mothers who seek medical advise on the same day are considered as very worried, they were (42.5%), and can be compared with large range of percentages in other studies, 10% 17%, 35% of 63% \cite{6,19,43,44}. Mothers with many children were found to be less worried than those with only one child. This is the effect of practice, partly of recognizing self-limiting fevers which disappear within 72 hours and partly to home management tried by these mothers. In this study this was significantly related to the number of children under 5 years in the family.

A large group of mothers use paracetamol as an antipyretic (82.9%) in comparison with (92%) reported by Casey, 1984\cite{43}. This small difference between the two reports, is most probably due to the fact that in our study some mothers still use aspirin as an antipyretic. While (23.3%) of the mothers follow the label to calculate the dose, others reported (75%) \cite{42}. Also in this study, (70.5%) follow doctor’s instructions in comparison with (37%) in other reports \cite{42}. This difference may be explained by the strong association between mother's knowledge and attitude and their educational level in Sudan. This is also reflected by the fact that (6.2%) of mothers who self-estimate the dose of the antipyretic. This misconception often leads to unnecessarily unsafe and inappropriate management. However, Parents should be taught that the drug does not necessarily make a child feel better and that treatment should be reserved for children who have the greatest need of relief\cite{56}.

Regarding the use of non-pharmacological remedies to reduce temperature, they are effective in the short term, however they will lead to increase the child’s discomfort and encourage temperature-conserving behavior and therefore cannot be recommended for children\cite{57}. Sponging, in fact, does not affect the thermoregulatory set point and the febrile child may experience discomfort as the hypothalamus attempts to off-set the decrease in body temperature produced by sponging \cite{58}. The role of tepid sponging to promote heat loss is controversial. Recent reports have shown a greater fall in temperature when tepid sponging has been combined with paracetamol\cite{59}.

Regarding traditional and harmful practices by mothers in managing febrile illnesses at home, it was found that a high proportion 209(71.6%) used to self-treat their children with antipyretics with or without antimalarias (Chloroquine), antibiotics or cough syrups. It was found that they also estimate the dose or follow drug instructions, and this is significantly related with
educational level. This result is similar to studies in other African communities where self-treatment of fever as malaria is common. Of 138 episodes of febrile illness, 60% were treated at home with herbal remedies or medicines purchased at local shops. This is the result reported in 1995 in Kenya.\(^{60}\)

In Tanzania, (71.7%) of patients treated their children with home-kept antimalarial drugs for a suspected malaria fever and (14.7%) consulted traditional healers.\(^{61}\)

Mothers in Kilifi, district on the Kenyan coast, recognized convulsions, anaemia and splenomegaly in their febrile children, and they tend to withdraw antimalarials from these children.\(^{62}\)

It's found that the response to most episodes of fever begins with self-treatment, and almost half of mothers rely exclusively on this. Self-purchase of drugs is ranging from (4-87%)\(^{63}\). In our study, traditional means were preferred by only (3.1%) of mothers which supports the findings in the study by McCombie\(^{63}\) who reported that exclusive reliance on traditional methods is extremely rare. Recent reports stated that (75.8%) of mothers managed their children diseases at home and used both traditional and modern treatment.

From this study, it's clear that Sudanese mothers, especially those who are illiterate have a poor knowledge about, and harmful practices towards fever and its management. They do not know what is fever except that the child feels hot, do not know thermometers, and don’t use them. Moreover, they couldn’t define fever in degrees of temperature, don’t know the indication of antipyretics and when should they start sponging.

In this study it was found that mothers are often reluctant to follow advice that are in conflict with their beliefs and established practices. For optimal education, to be effective, it must be developed according to mother’s needs and should draw on mothers’ skills and experience.\(^{65}\) A better understanding of mothers concern may bring health providers and parents closer. Information and education about mother concern may enable them by influencing the way they perceive the threat posed by fever and enhancing their personal
control (65). In 1980 Schmitt described fever phobia as undue parental fear of fever in their children (19). In 1984 Kramer and colleagues confirmed the presence of similar exaggerated fears among parents of all socioeconomic classes (3). Anecdotal experiences suggest that pediatricians may contribute to parental misconceptions about fever, although it’s unclear which part of the patient-doctor interaction may promote this fear. The results of this study support the previous findings of other reports and demonstrates that doctors differ substantially in their knowledge base of fever and its management. This may be due to their different background in medical education or clinical practice (66).

Compliance rate of doctors in this study was (74%) from the 108 questionnaires distributed, 75 were evaluated and analysed. This is close to the response found by M.Sarrell et al (64.6%), more close to the report of May (74%) in 1992 and ELieissa (70%) in 2000 (47). In this study doctors were three grades, house-officers, medical officers and registrars. Eighty five percent of them had practiced medicine for less than 5 years.

Two thirds of the doctors had a training course on temperature measurement in undergraduate course, although usually these courses are not intensive and do not concentrate on indications of treatment. There is greater disparity between the frequency of fever in clinical practice and the load of formal teaching devoted to its pathophysiology and management in medical schools (67).

In this study knowledge and attitudes of doctors correlate in some issues with work grade. Other studies didn’t find any significant differences with regard to grade (47). No other variables were reported as significant factors by any study.

In this study, (74%) of doctors treat fever to prevent febrile convulsions in comparison to (70%) reported by ELieissa et al 2001 (27). The belief that treating fever can prevent febrile convulsions is wrong and leads to more stimulation of parent fear. Comfort of the child should be the first and the only cause to treat fever. This was the opinion of less than third of doctors in this study, in comparison with (70%) surveyed by May (47).

Parents may not understand that many doctors support fever reduction because the child may be uncomfortable, not because of potential complication of fever.

There’s no evidence suggesting that brain damage, learning disability, death or epilepsy are well documented consequences of typical febrile convulsions (68, 69).

Sixty percent of doctors in this study used to advice good home care for the mothers whose children had a fit. Eighty percent of doctors
in the study conducted by May (47), always or often tried to educate parents and children about fever. The issue is that the advice should be true because parents learn from both doctor’s actions and advice.

The difference found between house officers, medical officers and registrars was in some aspects of knowledge and attitude, but it has no fixed pattern. Although registrars has better knowledge about definition of fever, temperature regulation mechanisms, common causes of fever, antipyretics doses and forms better than medical officers and house-officers, they were the more who think that prevention of convulsion is the main cause to treat fever.

Generally, a high proportion of doctors don’t have adequate knowledge about pathophysiology of fever. An unacceptable proportion doesn’t know when to intervene with tepid sponging and also an unacceptable proportion don’t know the common preparations of antipyretics and the doses.

There are few studies which compared the approach to fever between parents and medical personnel. Parent's opinions on health–related issues are shaped by information provided by doctors and nurses, in addition to the media, family members, neighbors, friends and others (70). Obviously, doctors and nurses obtain their knowledge mainly from more established sources, such as textbooks, journals, lectures and the internet. Nevertheless, they are not immune to cultural and other influences (49).

In our study nurses show poor knowledge about thermometers, although they are considered as the first who are responsible for recording temperature. It was found that all of the nurses could identify ordinary glass thermometers, but only 38(30.9%) could identify digital or dot strip. Regarding their practices, most of them 93(75.6%) measured temperature incorrectly.

In our study, a correlation was found only between some aspects of knowledge and the way to read temperature and the age of the nurse. This may be due to the fact that teaching systems in nursing school are improving.

Nurses in most studies had high compliance rate. In our study it’s (93.2%) similar to the report of M.Sarrel (93.4%), and 100% by Edwards (28-49).

The highly statistical significant difference found between mothers, doctors and nurses in this study, supports the findings of the study which was conducted in Israel (49). In our study, more doctors believe the benefit of fever (66.7%), nurses are less (48%) and only (1%) of mothers believes in the benefit of fever. This was the same in that study where (43%) of the parents recognize the benefit of fever. Also generally, mothers tend to treat low grade fever more than nurses
and doctors. In our study, (44%) of the doctors treat low grade fever, (37.4%) of nurses and (60%) of mothers. Others reported that, while (10.8%) of doctors treat low grade fever, (32.2%) of nurses and also (62.7%) of mothers do so with significant difference between the three groups in both studies\(^{(49)}\).

Administering antipyretics for mild fever (37.5-39 °C) may halt the body’s natural defenses and prolong the disease process\(^{(71)}\).

The knowledge about the main cause to treat fever was different from others studies. In our study prevention of convulsions was believed more by doctors (73%) than nurses (63%) and mothers (52%). In the other study far less than these numbers were reported and nurses were the most to do that (34.3%)\(^{(28)}\). Further more, previous results show that nurses remain unaware of recent findings that children with simple and complex febrile convulsions have the same benign outcome and long term prognosis in term of subsequent epilepsy, neurologic, motor, intellectual, cognitive and scholastic ability\(^{(72)}\).

In a 10 years follow up, children with febrile convulsions were reported to display similar academic and intellectual behaviors as control children\(^{(73,74)}\).

In our study, there was a statistically significant difference between mothers, nurses and doctors regarding the use of natural remedies other than sponging. Doctors tend to use them more than mothers and nurses.

The reverse is found in using tepid water for sponging. It’s used more by nurses. This means that attitude differs between the three groups. The difference is not related to a specific issue, but seems that a lot of factors may contribute to knowledge attitudes and so practices of mothers, nurses and doctors. The most important fact is that doctors are the mainstay of believes reaching mothers or nurses. They often recommend natural and pharmacological agents to lower fever. This is intended not to hasten recovery but to reduce child’s discomfort\(^{(75)}\).

This study reflect the poor practices of health workers regarding temperature measurement. There is no available thermometers in each facility included in the study. Only one thermometer per one facility in 18(39.1%) were found. Temperature charts are found in only 5(10.1%) of facilities. There’s considerable difficulties in practices in the study area correlating with the poor knowledge and wrong attitudes. In a survey in 66 health facilities using IMCI strategy, containing 364 health workers (20%) were doctors, (77%) were health assistants and (3%) were nurses, only (48%)
check children for temperature, (14%) took temperature correctly although (79%) of the chosen facilities had thermometers (76). Undue fear and unnecessary treatment of fever are epidemic among parents of infants and young children, even among the highly and well to-do. Considerable efforts will be required on the part of pediatricians and other child health workers to re-educate these parents about the definition, consequences and appropriate treatment of fever (41). Educational intervention was practiced in a controlled trial. It's found that education of parents reveals an increase in knowledge about fever over time and unnecessary physician contact and medical errors reduced (43).
CONCLUSION

• Of the 268 children included in the study, 241 (90.0%) were less than 3 years of age. Most of them 206(76.9%) presented with temperatures between 37.5 and 39.°C most of them presented with a local cause of fever and only 29(10.8%) showed no focus of infection.

• The most common causes of fever in this study were respiratory tract infections 165(61.5%) and malaria 19(7.1%). Otitis media comprises 70(3.7%), urinary tract infections 6(2.2%), measles 7(3.7%), urinary tract infections 6(2.2%) and measles 7(02.6%). Osteomyelitis, meningitis, abscesses, dehydration, other bacterial and viral infections comprise (7.1%).

• Two thirds of the children without a local cause of infection were below 1 year of age. Possible diagnosis of them were malaria 15(51.7%), occult bacterial infection 6(20.7%), viral infections 5(17.3%) and urinary tract infections in 3(10.3%).

• Mothers included in the study have poor knowledge about fever management. Only (15%) can define fever in terms of temperature degree and (1%) think it harmless and also beneficial. Few mothers (02.7%) think that being uncomfortable and ill is the main danger of fever which is
the main cause to treat it. Less than half of them know common sites of temperature measurement and about one fifth (24.7%) know temperature degrees. They have exaggerated fear of fever as they relate it to disease (90%) and treat it aggressively. Less than half of them treat only very high fever (39.7%).

• The mothers attitude towards fever is affected by the poor knowledge of fever. Only 8.2% of the mothers do use home thermometers and 3.4% used natural remedies to treat fever. Paracetamol is the most common antipyretic in (82.9%) of mothers. Only one third of them seek medical advise between 3-7 days.

• Knowledge and attitudes of mothers in this study correlated strongly with educational level, number of children under 5 years in the family and age of the mother.

• Few mothers in this study 9(3.1%), use traditional methods to treat fever. Also they do harmful practices like using cold or ice sponging, do sponging before antipyretic, use of aspirin and self treatment of fever by drugs.

• Doctors included in the study consist of three gardes, HO,MO and registrars. They differ in their knowledge according to their grades. Most of them (70.7%) know the
cut-off level of fever in children and more than half of them (56.0%) treats only high fever. They have poor knowledge about pathophysiology and most of them treat fever to prevent complications. Only one fifth of them (22.7%) know drugs forms and different concentrations and proper doses.

- Of the 123 nurses included in the study, less than half think that fever is beneficial, two thirds of nurses treat only high fever and most of them know the indications of sponging. The majority of nurses could not identify types of thermometers other than glass and measures temperature incorrectly.

- Concerning comparison between mothers, doctors and nurses in knowledge and attitude, they show considerable differences which are statistically significant. Mothers were more concerned about fever than doctors and nurses.

- Health facilities in the study area are deficient and poorly equipped. Thermometers are found in only 39.1% of facilities and temperatures charts in 10.9% of them.

**RECOMMENDATIONS**
• There is a need for health education of parents and the community on basic facts about fever, and the recommended home management for fever.

• Parents need to be trained about temperature measurement using available easy to use home thermometer or temperature strips.

• Health messages about fever need to be included in basic and high school curriculae.

• There is a need to include in the curriculae of medical, health sciences schools and medical nursing schools, temperature regulation modalities of management as well as training courses to master the skill of temperature taking and recording using different types of equipments.

• In-service training courses on measurement and recording of temperature are needed for nurses, Medical assistants (MA) and Health workers (H.W) in health centers and hospitals.

• Health education messages for HW and community levels should stress indications, doses and side effects of commonly used antipyretics and other methods used by mothers to treat fever.
• Health facilities need to have standard equipments of temperature measurement and records should be a routine task for nurses, medicals assistants and doctors working in health facilities.

• Standard protocols for management of fever should be developed and applied in all health facilities.
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