

**RISK FACTORS ASSOCIATED WITH PRESENCE OF GENERAL
DANGER SIGNS IN CHILDREN WHO PRESENT WITH ACUTE
SEVERE ILLNESS AT KENYATTA NATIONAL HOSPITAL**

**A dissertation in partial fulfillment for the Degree of Masters of
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Paediatrics, University of Nairobi (UON).**

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DECLARATION

This dissertation is my original work and has not been presented for the award of a degree in any other university

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DEDICATION

This work is dedicated to my dear wife Carine and our daughter Shanice. Thank you for your support and patience during the period of study away from home.

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ABBREVIATIONS

ETAT+: Emergency Triage Assessment and Treatment Plus admission care

IMCI: Integrated Management of Childhood Illnesses

KDHS: Kenya Demographic and Health Survey

KNH: Kenyatta National Hospital

MDG: Millennium Development Goal

PEU: Paediatrics Emergency Unit

WHO: World Health Organization

DEFINITION OF TERMS

1. *Acute illness*: Illness not lasting for more than two weeks.
2. *Caregiver*: An individual, such as a parent, foster parent or head of a household, who regularly attends to the needs of a child or dependent adult.
3. *General danger signs*: These are signs used in Integrated Management of Childhood Illnesses to assess severity of illness. They include the following:
 - The child is unable to drink or breastfeed
 - The child vomits everything
 - The child is convulsing during current illness.
 - The child is lethargic or unconscious
4. *Severe illness*: Illness whose management usually calls for one or more of six immediate, lifesaving interventions, that is; intravenous fluid resuscitation, oxygen, parenteral antibiotics, parenteral antimalarials, specific nutritional support and blood transfusion.

ABSTRACT

Back ground: Every year about 7 million children die before their 5th birth day. Most of these deaths occur in developing countries. These deaths result from a disease or a combination of diseases that can be prevented or treated by existing inexpensive interventions. The leading causes of child deaths are; acute respiratory infections (18%), diarrhea (11%), malaria (7%), measles (1%), and malnutrition increases the risk of dying from these diseases. Since most of these deaths occur in developing countries compared to developed countries, understanding the risk factors of the severe forms of illnesses may help in planning interventions for controlling childhood morbidity and mortality.

Objective: To determine the risk factors associated with presence of general danger signs in children who present with acute severe illness at Kenyatta National Hospital.

Methodology: This was a hospital-based, case-control study, carried out at the Kenyatta National Hospital Paediatrics Emergency Unit. Children aged 2-59 months presenting at Kenyatta National Hospital with signs and symptoms of acute severe illness were recruited, of whom one hundred and forty two were cases and one hundred and forty two were controls. Children were selected daily and enrolled after getting a written informed consent from their caregivers. Data were checked for completeness, entered into Microsoft excel data sheet, cleaned and exported to SPSS statistical package for analysis. Frequencies, means and proportions were calculated. To compare means student t-test was used. Statistical significance was taken at the level $p < 0.05$ and odds were calculated using both univariate and multivariate analysis.

Results: A total of 142 cases with general danger signs and 142 controls were included in the study. Cases were slightly older than controls, their mean age in months being 14.16 (SD±11.83) versus 12.68 (SD±10.3) respectively. Using multivariate logistic regression analysis, risk factors independently associated with presence of general danger signs were; use of biomass as the source of cooking fuel OR=3.38 (95% CI=1.41-8.06), P=0.006, severe pneumonia OR 5.2(95% CI=3.0-9.2), P=<0.001, having more than one diagnosis in a child OR=3.68 (95% CI=2.00-6.77), P= <0.001, and presentation to hospital for treatment later than 3 days of symptoms onset OR=1.32 (95% CI=1.14-1.53), P=<0.001.

Conclusion: This study shows that socioeconomic factors such as use of biomass as cooking fuel source is associated with presence of general danger signs in children with acute severe illness. Severe pneumonia and having more than one diagnosis in a child were the clinical factors associated with presence of general danger signs. Presentation to hospital for treatment later than 3 days was also associated with presence of general danger signs.

Recommendation: Use of cleaner fuels such as natural gas and electricity is recommended over biomass. Integrated approach to management of children who present with general danger signs is of utmost importance to deal with the multiple illnesses and there is need to educate parents/caregivers and communities about simple signs of diseases that suggest a need for seeking professional medical attention.

1. INTRODUCTION AND LITERATURE REVIEW

Every day, millions of parents take children with potentially fatal illnesses to first-level health facilities such as clinics, health centres, and outpatients departments of hospitals ¹. Many of these children die due to their severe illnesses. Most deaths among children under five years of age are still attributable to just a handful of conditions and are avoidable through existing interventions. Six conditions account for 70% to 90% of all these deaths. These are: acute respiratory infections (ARI), mostly pneumonia (18%), diarrhoea (11%), malaria (7%), measles (1%), HIV/AIDS (2%), and neonatal conditions mainly preterm birth, birth asphyxia, and neonatal infections (35%) ².

The reduction of child mortality rates in developing countries, which are about 5-15 times higher than those in developed countries, is one of the greatest public health challenges faced by developing countries ³. In many countries, attempts to achieve this goal are hampered by difficulties in access to health services that provide correct standard case management, or ignorance among families of the signs of severe disease in children or of the most appropriate place to go for treatment ³.

World Health Organization, with the aid of expert clinical input, developed evidence based Integrated Management of Childhood Illness (IMCI) strategy with an algorithm for assessment and management of sick children. The algorithm is able to identify severely ill children aged 2-60 months using the following signs; not able to drink or drinks poorly or not able to breastfeed, vomiting everything, convulsions and altered mental status (abnormally sleepy or difficult to rouse), evidence of severe malnutrition (severe wasting, oedema), respiratory distress characterized by lower chest wall retraction and stridor, severe dehydration characterized by

abnormal skin turgor and sunken eyes, meningitis (stiff neck), mastoiditis (tender swelling behind the ear), severe anaemia (severe palmar and/or conjunctival pallor), and corneal ulceration or clouding ¹. It is also able to identify severe illness in young infants aged 1 week to 2 months using the following signs; convulsions, severe chest wall indrawing, nasal flaring, grunting, bulging fontanel, umbilical redness extending to the skin, fever (axillary temperature of 37.5°C or above or feels hot) or low body temperature (less than 35.5°C or feels cold), many or severe skin pustules, lethargy or unconsciousness and less than normal movements ¹. These signs are able to identify children at high risk of death or serious disability ^{1,4}.

Paxton L.A et al carried out a study in a rural district of western Kenya and found that 27% of children seen in outpatient clinics had one or more of these signs and that pallor and chest wall retraction were the signs most likely to be associated with hospital admission. Presentation with any of these signs led to a 3.2 times likelihood of admission. Altered mental status was the sign most highly associated with death, followed by poor skin turgor, pallor, repeated vomiting, chest wall retraction, and oedema. Overall, the mortality risk associated with having at least one sign of severe illness was 6.5 times higher than that for children without any sign ⁴.

1.1. Burden of severe illness statistics

Despite the substantial reductions in the number of childhood deaths observed in recent decades, around 7 million children still die every year before reaching their fifth birthday. Almost all of these deaths occur in low and middle-income countries ². Sub-Saharan Africa and Southern Asia have the highest child mortality figures and progress in reversing this state of affairs has been slow ⁵. In Kenya, the 2008-2009 Kenya Demographic and Health Survey (KDHS) showed

remarkable declines in child mortality rates in all levels from rates observed in 2003. The under-five mortality rate declined from 115 deaths per 1000 live births in 2003 to 74 deaths per 1000 live births in 2008-2009 while the infant mortality rate dropped from 77 deaths per 1000 live births to 52 deaths per 1000 live births. This implies that one in every 19 children born in Kenya dies before its first birthday, while one in every 14 children who survive beyond the first year does not live to age five ^{6,7}.

The burden of severe paediatric illness and preventable death in developing countries is still high ⁸. Terry N et al carried out a study in seven less developed countries and found that 90% of children assessed by the study team had severe forms of common childhood illnesses, especially pneumonia, diarrhoea, malaria, sepsis, and meningitis. These conditions are also the most common serious illnesses for which children are referred to hospital from ambulatory clinics ⁹.

For better management of these children, IMCI strategy was developed from the need for improved curative care. The strategy combines improved management of childhood illness with aspects of nutrition, immunization, health promotion, improvements in the health system required for effective management of childhood illnesses, and improvements in family and community practices especially health care-seeking behaviours in order to reduce deaths and the frequency and severity of illness and disability ¹. Simplified guidelines allow a broader range of staff with less training to learn and implement effective case-management. This is of crucial importance for peripheral health facilities which are staffed by less trained health workers and where the majority of children with severe illness are first attended ⁸.

However, there still exist gaps in identifying and managing children with acute severe illness and one of these gaps is the large number of patients presenting with severe illness ⁹. Gitau J found that a significant number of children with severe illness were brought to hospital later than three days following onset of illness. This delay in seeking care was partly attributed to worries of parents about the cost of treatment ¹⁰. Therefore, there is need to understand the risk factors for these acute severe childhood illnesses to develop appropriate strategies for management.

1.2. Socio-demographic factors that influence child survival

Socio-economic factors such as income, occupation, education and social class are often mentioned as important factors in influencing perceptions, which determine people's health behaviour and response to illness ¹¹. KDHS 2008-2009 also shows that in addition to mother's education and socio-economic status, her age, place or region of residence influence infant and child survival. The neonatal, post neonatal, and infant mortality rates exhibit the expected U-shaped association with mother's age, (that is to say, high mortality rates for younger and older mothers and low mortality rates for women in middle age groups). KDHS, further, shows that there is generally an increased risk of death for first births and for higher-order births ⁶.

A mother's education can exert a positive influence on children's health and survival. Under-five mortality is noticeably lower for children whose mothers either completed primary school (68 deaths per 1000 live births) or attended secondary school (59 deaths per 1000 live births) than among those whose mothers have no education (86 deaths per 1000 live births) ⁶. However, under-five mortality is highest among children whose mothers have incomplete primary

education and similar patterns are observed for infant mortality rates. Infant and child mortality rates generally decline as the wealth quintile increases, though the pattern is not uniform ⁶.

Cleland and van Ginneken summarized, after controlling for dwelling and household economic characteristics, individual studies in which "the maternal education - mortality relationship" was analyzed. The result was that "usually the effect of education remains statistically significant" even after controlling for household economic characteristics. The authors broadly concluded that "the economic advantages associated with education (income, water and latrine facilities, clothing, and housing quality) probably accounts for about one-half of the overall education-mortality association" ¹². Moreover studies by Mahalanabis and other authors, also prove that even though maternal education is indeed very much intertwined with overall socio-economic status, it does have a perpetuating effect on the survival of children in Bangladesh, if not equally significant in other developing countries ¹³.

A few of the possible mechanisms through which maternal education works to improve children's health are pointed out below ¹¹.

1. Education makes a woman conscious about the wellbeing of herself and her family. It gives the basic ideas about the path to well-being and also equips and encourages her to increase knowledge on healthy living.
2. Education helps to form the attitude to practice "good manners of hygiene".
3. Education equips mothers with the knowledge of scientific causes of disease and proper health behaviour and illness behaviour for preventive and curative measures.
4. Education encourages mothers to adopt proper feeding practices.

5. Education makes the mothers more willing to use health care services when necessary.
6. Education allows greater exposure to the mass media, which can keep mothers better informed about the health issues.
7. Education empowers mothers to make and implement proper and timely decisions regarding their children's health.

1.3. Factors that influence disease specific morbidity in children

Broor S et al, in a study done in New Delhi India, on stepwise logistic regression analysis, it was found that lack of breastfeeding, inappropriate immunization for age, upper respiratory tract infection in mother, upper respiratory tract infection in siblings, and severe malnutrition were associated with severe lower respiratory tract infections. In the same study, cooking fuel other than liquid petroleum gas was reported as a significant contributor of severe acute lower respiratory tract infections in children who are under five years of age ¹⁴.

Shah N et al carried out another study in South Kerala also in India and noted that parental education, environmental pollution and discontinuation of breastfeeding in young infants contributed to development of severe pneumonia ¹⁵. Malnutrition, previous history of severe ARI unresponsiveness to earlier treatment, and use of non-allopathic medicine were also significant risk factors associated with severe pneumonia in children ¹⁵.

In Dhaka, Bangladesh, the association of maternal education and family income with severity of disease due to diarrhoea in children was examined. After adjusting for family income, seven or more years of school education was associated with 54% reduced risk of severe disease as

indicated by the presence of dehydration. Income in the uppermost quartile of the population, independently of maternal education, was associated with 41% reduced risk of severe disease compared to the lowest quartile. In the logistic regression model the effect of maternal education remained high after adjustment for several confounders. Based on the concept that socioeconomic variables operate through a set of proximate variables it is contended that maternal education, independently of economic status, through its impact on disease from acute diarrhoea, favourably influences child survival ¹³.

Dikassa et al noted in a study done in Kinshasa, former Zaire that mothers' lack of knowledge on the significance of child caretaker cleanliness was strongly related to severe diarrhoeal disease. He also states that unsanitary disposal of child faeces and garbage were significant predictors of severe diarrheal disease and these behavioral factors were responsible for up to 70% of the severe diarrhoea cases. Thus, health education initiatives focusing on this behaviour could eliminate as much as 70% of the diarrhoea cases ¹⁶. Water sanitation and hygiene interventions, as well as their combination are effective at reducing diarrhoeal illness ^{17, 18, 19}. Several studies have shown that regular hand washing with soap reduces the incidence of diarrhoea in children younger than 5 years in communities with a high incidence of diarrhea ^{20, 21}. In addition, younger children and children of younger mothers were associated with a higher likelihood of diarrhoea¹⁹.

In Guinea-Bissau, there was an increased rate of diarrhoea in children from households headed by a person under 30 years of age, households with domestic animals, and families who had the practice of eating cold leftovers. Diarrhoeal rates were reduced among children from families who prepared at least two meals per day. There was, in addition, a strong and independent

association with the type and ownership of water supply, with a 1.4 rate ratio among children from families with a public, unprotected water supply compared with those who used their own, protected supply. Among the maternal factors there were independent associations between diarrhoeal rates and the mother's ethnic group and education. Specifically, children of mothers who had ≥ 7 years in school had a 25 percent reduced diarrhoeal rate. None of the variables related to the father were associated with diarrhoea. This study also suggested that improved food hygiene may decrease diarrhoeal rates primarily in older, fully weaned children ²².

In a study done by Lee et al in Cote d'Ivoire to identify clinical disorders associated with severe illness in children with diarrhoea, dehydration was the clinical disorder most strongly associated with severe illness. In addition, however, several other common life threatening disorders were associated with severe illness including bacteraemia, malarial parasitaemia, wasting, and anaemia. The majority of children with severe illness had two or more concurrent disorders and were much more likely to have multiple disorders than were children with non-severe illness. These findings suggest that children at risk of becoming severely ill with diarrhoea may, to a large extent, be the same children who are at risk of becoming severely ill with any of the diseases that are common causes of childhood mortality in Africa ²³.

Safeukui-Noubissi et al carried out a study to identify the risk factors associated with severe malaria among children in Bamako, Mali and noted that the following characteristics were all associated with a decreased risk of severe malaria in children: higher maternal education, mother's adequate knowledge about malaria, her use of mosquito bed nets and breast-feeding for at least 2 years. These findings strongly support the hypothesis that maternal factors are central

to the development of severe malaria in children. The authors concluded that programmes aiming to improve maternal education may reduce the incidence of severe malaria in children and should therefore be advocated in Bamako and in areas with similar epidemiological patterns for malaria²⁴.

The high prevalence of bacterial and parasitic diseases in developing countries contributes greatly to malnutrition. Similarly, malnutrition increases one's susceptibility to and severity of infections, and is thus a major component of illness and death from disease. It is consequently the most important risk factor for the burden of disease in developing countries²⁵. Islam et al conducted a case-control study in Bangladesh to examine the relation of maternal and socioeconomic factors with the development of severe malnutrition in young children. The results of this study showed that maternal factors such as illiteracy, mothers' employment outside homes, lack of breastfeeding and selected socioeconomic indicators such as poor family income, use of unprotected surface water or unhygienic latrine were significantly associated with severe malnutrition in their children²⁶. In multivariate analysis, maternal illiteracy and lack of breastfeeding were associated with approximately fourfold increased risk of severe malnutrition in their children. A strong positive association of employment of mothers outside homes with fivefold increased risk was surprising and may reflect a complex social problem of poor urban mothers²⁶.

In view of the slow rate at which advances in infant and child survival have been occurring among people in poor countries and among the poorest people in wealthier countries, the United Nations' Millennium Development Goal 4 aims at reduction of child mortality, the target being to reduce by two thirds, the under-five mortality between 1990 and 2015. It proposes that to

reduce child mortality will require; better national and sub-national data on causes of mortality with identification of barriers to accelerated coverage, addressing inequality in the provision of health services, the development of health systems on the premise that services are entitlements, improving access to nutrition and nutritious foods and empowering families, care-givers and communities to practice optimal care of newborns and young children and provide support to families for family planning. Education, especially for girls and mothers and raising family income would contribute in saving children's lives ⁵. On this note, Millennium Development Goal (MDG) 1 proposes to eradicate extreme poverty the target being to halve the proportion of people living on less than one US dollar a day by the year 2015.

As recommended by MDG 4, to reduce child mortality will require better national and sub-national data on causes of mortality, there is also need to document the risk factors associated with severe disease syndromes in children. This study, therefore, aimed at determining the risk factors associated with presence of general danger signs in children who presented with acute severe illness at Kenyatta National Hospital (KNH).

2. PROBLEM STATEMENT

In KNH, specifically at Paediatric Emergency Unit (PEU) many children present with various levels of severity of illnesses ranging from mild to severe and they include; respiratory infections, diarrhoeal diseases, malaria, malnutrition, immunizable diseases such as measles among others. These are the leading causes of childhood morbidity and mortality as evidenced by literature ² and contribute to the majority of deaths seen among children attended to in KNH.

Therefore, prevention and management of these acute severe illnesses would be enhanced by a better understanding of the factors associated with the presentation of severe illnesses.

3. STUDY UTILITY

The results of this study will guide:

- Planning strategies at community level for prevention of acute severe illness.

- Education of caregivers in matters concerning household and personal hygiene and early care-seeking.

4. RESEARCH QUESTION

What are the risk factors associated with acute severe illness in children presenting at Kenyatta National Hospital?

5. OBJECTIVES

5.1. Main objective:

To determine the risk factors associated with presence of general danger signs in children who present with acute severe illness at Kenyatta National Hospital.

5.2. Specific objectives:

1. To determine the socio-demographic factors associated with presence of general danger signs in children presenting with acute severe illness at Kenyatta National Hospital.

2. To establish the clinical conditions associated with the general danger signs in children presenting with acute severe illness at Kenyatta National Hospital.

6. METHODOLOGY

6.1. Study design:

Hospital-based case control study.

6.2. Study site and Setting:

The study was carried out at the Kenyatta National Hospital Paediatric Emergency Unit. Kenyatta National Hospital is the largest public hospital in Kenya. It is located in Nairobi the capital city of Kenya. It is both referral centre for paediatric cases (defined as up to 12 years of age), as well as a primary health facility for sick children mostly serving the residents of Nairobi, and a big number of children from bordering districts. A few children, mostly referral cases requiring sub-specialist care and more intensive management come from far flung districts¹⁰. Sick children below 12 years with various medical conditions are first seen at PEU. On average 100 children are seen per day. Of these, about 30 children are seriously sick and are admitted each day. Among the admissions, about one third have general danger signs²⁷. A triage system is in place at the registration point upon entry into the PEU. Here, children who are seriously sick are identified and moved to a designated resuscitation room where a doctor and nurses most of whom have gone through the Ministry of Health Emergency Triage Assessment and Treatment plus Admission care (ETAT+) ²⁸ training attend to them.

5.3. Study population

The study population comprised of all children aged between 2-59 months with an acute severe illness who presented to PEU during the study period. Children presenting with general danger signs were recruited as cases after fulfilling the inclusion criteria. Those presenting with acute severe illness but without general danger signs were selected as controls.

6.4. Sample size calculation

Sample size was calculated using the following formula for the calculation of a sample size in an unmatched case-control study evaluating the difference between two groups.

$$n = \left(\frac{r+1}{r} \right) \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

N= Sample size

r=1 (equal number of cases and controls)

Z_β= Value of the standard normal distribution corresponding to the desired level of power (that is 0.84 for a power of 80%).

Z_{α/2} = Value of the standard normal distribution corresponding to a significance level of alpha (that is, 1.96 for a two sided test at the 0.05 significance level)

p̄ = Average proportion exposed.

P1= Proportion exposed in the cases group

P2 = Proportion exposed in the control group

For the proportion exposed in the control group,

P2 = 0.54 (use 54% being the percentage of sick children who were admitted with no general danger signs in a study done in Siaya, western Kenya in 1993⁴).

To get the proportion exposed in the cases, P1, use the following formula,

$$P_{case\ exp} = \frac{OR p_{controls\ exp}}{p_{controls\ exp} (OR - 1) + 1} \quad P_{case\ exp} = \frac{2.0(.54)}{(.54)(2.0 - 1) + 1} = .7012$$

Therefore, P1 = **0.7012**, and the average proportion exposed = (.54+.7012)/2=.620

$$r = 2$$

$$\bar{p} = 0.620$$

$$Z_{\beta} = 0.84$$

$$Z_{\alpha/2} = 1.96$$

$$P1 = 0.7012$$

$$P2 = 0.54$$

$$n = 2 \frac{(0.620)(1 - 0.620)(0.84 + 1.96)^2}{(0.7012 - 0.54)^2} = 142$$

N = Minimum of 142 for each group.

6.5. Inclusion criteria

- All sick children between 2 and 59 months of age seeking care at Kenyatta National Hospital, with an acute severe illness and accompanied by a parent/ caregiver.
- Children presenting with general danger signs. Thus, a child who is unable to drink or breastfeed, vomits everything, convulsing during the current illness and the child who is lethargic or unconscious (cases).
- Children with acute severe illness but without general danger signs (controls)
- Caregiver consent to take part in the study.

6.6. Exclusion Criteria

- Children with chronic illness for example congenital heart disease, cerebral palsy, sickle cell disease, chronic kidney disease and epilepsy.

6.6.1. Definition of cases and controls

1. *Cases*: Children aged between 2 to 59 months presenting at PEU with general danger signs and fulfilling the inclusion criteria.

2. *Controls*: Children in the same age group as the cases presenting with no general danger signs and fulfilling the inclusion criteria.

6.7. Sampling method

Consecutive sampling method was applied. Enrollment of patients was done for 8 hours every day (either at night or during daytime). This time was randomly chosen after dividing 24 hours into three 8-hourly blocks. These 8 hour blocks were recorded on designed ballot papers bearing the date and time block of the day and the researcher would pick one ballot paper, at random from the three ballot papers, go to PEU and enroll patients during that time block. This method was preferred to minimize selection bias.

6.8. Procedure

6.8.1. At the triage area

Children presenting at PEU were triaged by the researcher or his research assistant. The research assistant, a clinical officer, received two days of training on completing the questionnaire and using other data collection tools by the principal investigator. A screening tool (refer to appendix

I) adapted from WHO IMCI guidelines was used to identify those with general danger signs (cases) and those with acute severe illness but without general danger signs (controls). The data collection tools were pretested at the time of training the research assistant to see whether they had been well developed for complete data collection. A short history was taken at the triage point to determine whether a patient met the set inclusion criteria. The emergency care of the child was not interrupted by the interview. All information was collected using a questionnaire (see Appendix II).

6.8.2. In the resuscitation room

Once a child with general danger signs was identified and sent to the resuscitation room, he/she was resuscitated following the standard of care of emergencies at PEU KNH and stabilized. Parent/caregiver would be updated on the condition of the child and was informed of the study. Once the parent/caregiver understood the study requirements, he/she was given an informed consent form to sign or thumb print for their child to be recruited as a study patient.

6.8.3. Selection of cases: All children aged between 2-59 months, with an acute severe illness, presenting with general danger signs were recruited as cases after fulfilling the inclusion criteria.

6.8.4. Selection of controls: Controls were selected from the same study population; these were children with acute severe illness but with no general danger signs and satisfied the eligibility criteria for this study. Systematic sampling of controls was used such that every other control was selected. This was preferred because the number of children who are admitted through PEU

with acute severe illness but with no general danger signs (controls) is about twice as big as the cases ²⁷.

6.8.5. Questionnaire: A two-part questionnaire was used to collect data. Part I was administered to the parent/caregiver and captured demographic variables including; age, sex of the child, birth order, relationship of caregiver to the child, and age of parent. Socioeconomic variables such as education of parents, their employment status and estimated wages, type of housing and sanitation data was also recorded on part I of the questionnaire. Documentation of major presenting complaints and clinical signs was made using part II of the questionnaire which is structured in detail to capture clinical signs of acute severe illness in children less than five years of age. The researcher or his research assistant examined the children and documented clinical findings. The physical examination did not compromise the resuscitation of the child who needed it.

6.9. Data management

Data from the interviews were recorded in questionnaires and clinical findings collected and recorded in structured data collection tools (appendix II). Data were checked for completeness and accuracy after collection, on a daily basis, and entered into a personal computer using Microsoft excel data sheet.

6.10. Data analysis

Data were entered into Microsoft excel data sheet, cleaned and exported to SPSS version 17.0 statistical package for analysis. Frequencies, means and proportions were calculated. To compare

means student t-test was used. Statistical significance was taken at the level $p < 0.05$ and odds were calculated using both univariate and multivariate logistic regression models.

6.11. Dissemination of results

The results of the study will be strictly disseminated for educational purposes; copies of the study findings will be submitted to the Department of Paediatrics and Child Health, University of Nairobi, Kenyatta National Hospital, University library, and efforts will be made for the results to be published in scientific journals. The results will also be presented in scientific conferences.

6.12. Ethical consideration

A permission to carry out this study was sought from the Department of Paediatrics and Child Health of the University of Nairobi and Kenyatta National Hospital Ethics and Research Committee (reference number KNH-ERC/A/201). Objectives and procedures of the study were fully explained to parents or significant other and a written informed consent was obtained from caregivers prior to enrolling them and their children into the study. Parents/caregivers of critically ill children were received with empathy, they were reassured that their children were going to receive optimum care available, and then they were shown where to sit as their children were being attended to. After the children had been resuscitated, for those who needed it, and stabilized the researcher got back to the parents/caregiver to update them on the condition of their children. For those children who died at PEU, the team at PEU approached the parent/caregiver in a polite manner to inform him or her about the outcome of the resuscitation and provided counseling session.

Study patients were given a unique study identification serial number and their data were not linked to their names or hospital identification number during analysis.

7. RESULTS

A total of 142 cases with general danger signs and 142 controls were included in the study. Table 1 below shows time-blocks and number of patients recruited during each time-block of the day. There were fewer patients recruited between 12pm and 8am, 19% of cases and 14% of controls. However, the distribution of the number of patients recruited at different time-blocks was almost similar among cases and controls, $p = 0.334$.

Table 1: Time-blocks for each day of patient recruitment

Group	8am-3pm	4pm-11pm	12pm-8am	Total	Pearson Chi Square
Cases	54(38%)	61(43%)	27(19%)	142	Chi = 2.2; p = 0.334
Controls	65(46%)	57(40%)	20(14%)	142	

Distribution of basic demographics among cases and controls

Table 2, below shows the distribution of cases and controls according to basic demographic factors including age, sex and birth order. The mean age of cases and controls were 14.16 and 12.68 months, respectively. There were 75(53%) males among cases and 84(59%) males among the controls. First birth order occurred in 58(41%) cases and a similar number of controls 58(41%), while higher birth order (\geq third born) accounted for 19% and 25% of cases and controls respectively.

Table 2: Distribution of basic demographics among cases and controls

Characteristics	Cases	Control
Age(Mean(SD))	14.16(11.83)	12.68(10.3)
Gender		
Male	75(53%)	84(59%)
Female	67(47%)	58(41%)
Birth order		
First	58(41%)	58(41%)
Second	57(40%)	48(34%)
Third or above	27(19%)	36(25%)

Factors associated with general danger signs

Caregiver factors were classified and analyzed either as demographic or socioeconomic factors. Table 3 presents findings of the analysis of caregiver demographic characteristics according to case and control status among children presenting with acute severe illness. On average, both mothers and fathers of cases were slightly older compared to parents of controls but parental age (maternal, OR =1.0(95% CI = 0.97-1.1), P =0.593 and paternal, OR =1.0(95% CI= 0.97-1.1), P =0.663) was not significantly associated with presence of general danger signs. Similarly, parental education and marital status did not show significant associations with presence of general danger signs (Table 3).

Table 3: Caregiver demographic characteristics according to case and control status

Characteristics	Case	Control	OR (95% CI)	P-Value
Mother's Age(Mean{SD})	27.11(5.83)	26.76(5.1)	1.0(0.97-1.1)	0.593
Father's Age(Mean{SD})	32.3(6.48)	31.95(6.09)	1.0(0.97-1.1)	0.663
Marital status				
Married	122(86%)	118(83%)	1.00	
Single	14(10%)	13(9%)	1.0(0.5-2.3)	0.92
Other	6(4%)	11(8%)	0.5(0.2-1.5)	0.222
Mother's Education				
None	3(2%)	2(1%)	1.00	
≤Secondary	108(77%)	110(79%)	0.7(0.1-4.0)	0.646
College	29(21%)	27(19%)	0.7(0.1-4.6)	0.725
Father's Education				
None	1(1%)	1(1%)	1.0(0.06-16.4)	0.994
≤Secondary	90(73%)	91(75%)	1.00	
College	33(26%)	21(24%)	1.2(0.6-2.1)	0.634

Caregiver socioeconomic characteristics according to case and control status

Distribution of caregiver socioeconomic characteristics is presented in table 4. Most of the mothers of both cases (56%) and controls (65%) were home makers. Maternal occupation did not significantly impact on case or control status. For fathers, most were informally employed, cases (71%) and controls (66%) and this was not associated with development of general danger signs. Forty seven percent of cases had medical insurance cover compared to 39% of controls, but this difference did not achieve statistical significance OR=0.7 (95% CI=0.5-1.2), P=0.188 (Table 4).

Table 4: Caregiver Socioeconomic characteristics according to case and control status

Characteristics	Case	Control	OR (95% CI)	P-Value
Mother's Occupation				
Home making	79(56%)	93(65%)	1.00	
Informal employment	45(32%)	36(25%)	1.5(0.9-2.5)	0.154
Formal employment	18(13%)	13(10%)	1.6(0.8-3.5)	0.216
Father's Occupation				
Unemployed	4(3%)	4(3%)	1.00	
Informal employment	87(71%)	80(66%)	1.1(0.3-4.5)	0.908
Formal employment	32(26%)	37(31%)	0.9(0.2-3.7)	0.846
Family insurance cover				
Yes	67(47%)	56(39%)	1.00	
No	75(53%)	86(61%)	0.7(0.5-1.2)	0.188
Access to transport funds				
Always	90(63%)	70(50%)	1.00	
Often	34(24%)	40(28%)	0.7(0.4-1.2)	0.143
Rarely	11(8%)	18(13%)	0.5(0.2-1.1)	0.073
Never	7(5%)	13(9%)	0.4(0.2-1.1)	0.079

Comparing children's factors among cases and controls

The mean age (in months) of the children shows that cases were likely to be older 14.16 (SD±11.83) versus 12.6 (SD±10.3) for controls, but the difference in their age did not achieve statistical significance, P= 0.263. Birth order showed a similar number of first born children in both cases and controls, 41% while second birth order was reported in 40% of cases compared to 34% of controls; this difference did not have a statistical significance, OR=1.2(95% CI=0.7-2.0), P= 0.524. The mean duration of illness from symptoms onset to presentation to a health facility for treatment was 4 days for cases and 3 days for controls. This time difference was statistically significant, OR = 1.3 (95% CI=1.1-1.4), P = <0.001 (Table 5).

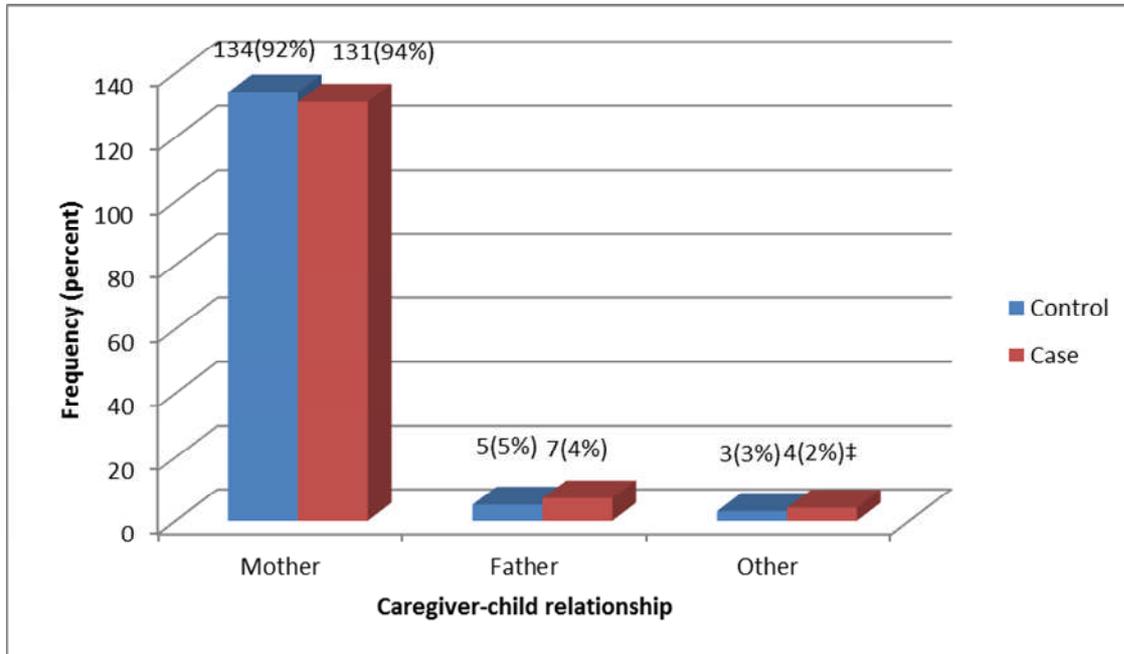
Table 5: Children's factors and presence of general danger signs

Characteristics	Case	Control	OR (95% CI)	P-Value
Age(Mean{SD})	14.16(11.83)	12.68(10.3)	1.0(0.99-1.03)	0.263
Age in months				
≤12 months	94(66.2%)	100(70.4%)	1.0	
13-36 months	39(27.5%)	36(25.4%)	1.2(0.7-2.0)	
37-60 months	9(6.3%)	6(4.2%)	1.6(0.5-5.7)	0.636
Gender				
Male	75(53%)	84(59%)	1.00	
Female	67(47%)	58(41%)	1.3(0.8-2.1)	0.282
Birth order				
First	58(41%)	58(41%)	1.00	
Second	57(40%)	48(34%)	1.2(0.7-2.0)	0.524
Third or above	27(19%)	36(25%)	0.8(0.4-1.4)	0.361
Duration(mean{SD}) of illness in days	4.0(2.4)	3.0(1.8)	1.3(1.1-1.4)	<0.001

Caregiver relationship to the child in both cases and controls

The children were mostly brought to hospital by their mothers 131 (94%) in the cases and 134 (92%) in the controls, followed by the fathers 7(4%) for the cases and 5 (5%) for the controls (Figure 1).

Figure 1: Distribution of caregiver relationship to the child



[‡]Other included grandparent, aunt, sister or guardian.

Nutrition and immunization status among cases and controls

Nutrition and immunization status of both cases and controls is presented in table 6. Thirty seven (26%) cases were exclusively breastfed up to six months compared to 54 (38%) controls. For partial breastfeeding, 55 (39%) cases and 48 (34%) controls were partially breastfed in the first 6 months whereas 50 (35%) cases had stopped breastfeeding before the age of six months compared to 40 (28%) controls. The odds of general danger signs among children who stopped breastfeeding before six months of age was 1.8 times (95% CI=1.3-3.3) that of exclusively (up to six months) breastfed infants, P=0.046. A comparable proportion of cases (98%) and controls (97%) had either completed their immunizations schedule or it was up-to-date. The odds of general danger signs did not differ significantly between well-nourished and poorly nourished

children based on weight for height (WH)-Z scores (<-2 SD), OR = 1.1 (95% CI = 0.6-1.8), P = 0.800. (Table 6).

Table 6: Nutrition and immunization status among cases and controls

Characteristics	Cases	Control	OR(95% CI)	P-Value
Breastfeeding				
Exclusive	37(26%)	54(38%)	1.00	
Partial	55(39%)	48(34%)	1.7(0.9-3.0)	0.077
Stopped before 6 months [☒]	50(35%)	40(28%)	1.8(1.0-3.3)	0.046
Immunization				
Complete/up-to-date	139(98%)	138(97%)	1.00	
No/Incomplete	3(2%)	4(3%)	1.3(0.2-9.3)	0.702
Weight/height Z-Score				
Not malnourished	95(67%)	97(68%)	1.00	
Malnourished (<-2 to -4SD)	47(33%)	45(32%)	1.1(0.6-1.8)	0.800

☒Complete cessation of breastfeeding before 6 months of age

Household characteristics as seen among cases and controls

Most households, 61% for cases and 60% for controls had between four and five people living in the same house. Majority of the children, 55% cases and 59% controls were from families who live in a one-room house. The odds of developing general danger signs did not differ significantly among children from different house sizes OR=1.2 (95% CI=0.7-2.0), P=0.581. Use of biomass as source of cooking fuel was significantly associated with presence of general danger signs 93 (67%) cases versus 70 (49%) controls, OR=1.8 (95% CI=1.0-3.2), P=0.017. Eighty seven (61%) of cases reported eating cold leftovers compared to 63 (44%) of controls and the difference was statistically significant, OR=2.0 (95% CI=1.2-3.2), P=0.004 (Table 7).

Table 7: Comparing household characteristics among cases and controls

Characteristics	Cases	Controls	OR(95% CI)	P-Value
Family Size				
2-3 people	42(30%)	46(32%)	1.00	
4-5 people	87(61%)	85(60%)	1.1(0.7-1.9)	0.663
>5 people	13(9%)	11(8%)	1.3(0.5-3.2)	0.576
No. of rooms				
1room	78(55%)	84(59%)	1.00	
2 rooms	26(18%)	22(16%)	1.2(0.6-2.3)	0.543
>2 rooms	38(27%)	36(25%)	1.2(0.7-2.0)	0.581
Cooking fuel				
Natural gas/electricity	35(25%)	47(33%)	1.0	
Biomass	93(67%)	70(49%)	1.8(1.0-3.2)	0.017
Eating of cold leftovers				
No	55(39%)	79(56%)	1.00	
Yes	87(61%)	63(44%)	2.0(1.2-3.2)	0.004
Water source				
Tapped into house	17(12%)	25(18%)	1.00	
Tapped within compound	99(70%)	81(60%)	1.7(0.9-3.4)	0.121
River/ vendor/ wells	26(18%)	31(22%)	1.2(0.6-2.8)	0.610
Toilet type				
Flushed with water	36(26%)	36(26%)	1.00	
Latrine	101(72%)	101(72%)	1.0(0.6-1.7)	1.00
Shared facility	4(3%)	4(3%)	1.0(0.2-4.3)	1.00

* Three cases and 2 controls used electricity.

Comparing admission clinical diagnosis among cases and controls

The admission clinical diagnoses among cases and controls were analyzed using univariate method to determine whether there was any association with presence of general danger signs. Table 8 shows that having more than one diagnosis in a child was common and occurred in 51% of cases compared to 26% of controls. This clinical factor had a statistically significant association with presence of general danger signs, OR=2.9 (95% CI=1.8-4.8), P= <0.001. Severe pneumonia was mostly diagnosed in cases 50% versus 18% in controls and this difference was statistically significant, OR= 5.2 (95% CI=3.0-9.2), P <0.001 (Table 8).

Table 8: Comparing admission clinical diagnosis among cases and controls

Characteristics	Case	Control	OR (95% CI)	P-Value
Diarrhoea with dehydration	50(35%)	56(40%)	0.8(0.5-1.4)	0.464
Malaria	6(4%)	5(4%)	1.2(0.4-4.1)	0.759
Severe pneumonia	71(50%)	26(18%)	5.2(3.0-9.2)	<0.001
Number of diagnoses				
One	70(49%)	105(74%)	1.00	
More than one	72(51%)	37(26%)	2.9(1.8-4.8)	<0.001

Factors independently associated with General Danger Signs

Multivariate analysis was conducted using logistic regression model adjusting for the effect of age and sex of the child's risk of developing general danger signs during acute severe illness (Table 9). Having more than one diagnosis in a child ($p < 0.001$), presence of severe pneumonia ($p < 0.001$), use of biomass as a source of cooking fuel ($p = 0.006$) and presenting to hospital later than three days of symptom onset ($p < 0.001$) were significantly associated with presenting with general danger signs. The odds of presenting with general danger signs was approximately four-fold higher in a child with more than one diagnosis compared to those with only one diagnosis, $OR = 3.68$ (95% CI = 2.00-6.77). Though eating of cold leftover foods appeared to be associated with presence of general danger signs, this practice, however, did not achieve statistical significance ($p = 0.052$).

Table 9: Factors that were independently associated with General Danger Signs.

Characteristic	Odds Ratio (95% CI)	P value
Age in months	1.00(0.98-1.03)	0.741
Female	1.19(0.66-2.12)	0.568
Cooking fuel		
Natural gas/ electricity	1.00	
Biomass	3.38(1.41-8.06)	0.006
Presence of more than one illness	3.68(2.00-6.77)	<0.001
Severe pneumonia	4.32(2.5-8.6)	<0.001
Exclusive breast feeding	1.00	
Partial breast feeding	1.59(0.8-3.2)	0.199
Weaned before 6 months	1.65(0.77-3.46)	0.193
Eats cold leftover food	1.78(0.97-3.13)	0.052
Duration of symptoms (>3 days)‡	1.32(1.14-1.53)	<0.001
Access to funds for transport		
Often	0.61(0.30-1.25)	0.169
Rarely	0.37(0.14-1.05)	0.054
Never	0.83(0.25-2.8)	0.765

‡ Duration between symptoms onset and presentation to hospital

8. DISCUSSION

The results of this study showed that the major risk factors for presence of general danger signs in the studied population of children presenting with acute severe illness at Kenyatta National Hospital in Kenya are; use of biomass as cooking fuel source, having more than one diagnosis in a child, presence of severe pneumonia and presenting to hospital later than three days of symptoms onset.

Use of biomass for cooking was significantly associated with presence of general danger signs, ($p = 0.006$). In households using biomass fuels, the risks seem to be fairly strong, presumably because of the high daily concentrations of pollutants found in such settings and the large amount of time young children spend with their mothers doing household cooking. Studies on indoor air pollution from household biomass fuels are reasonably consistent and show a strong significant increase in risk for exposed young children compared with those living in households using cleaner fuels or being otherwise less exposed ²⁹. Indoor air pollution emerges as an important risk factor for acute respiratory infections (ARI) in developing countries. Other studies show that many homes contain high levels of smoke from the combustion of biofuels such as wood, crop residues, and animal dung for cooking or heating ^{30, 31}. In Nepal, results of a semi-quantitative epidemiological study conducted showed a direct relation between reported hours/day spent near the stove by infants and children aged less than 2 years and episodes of life threatening acute respiratory infections ³¹.

Having more than one diagnosis in a child was strongly associated with presence of general danger signs was ($p < 0.001$). The odds of having general danger signs was approximately four-fold higher in a child with more than one diagnosis compared to those with only one diagnosis, OR = 3.68 (95% CI=2.00-6.77), P-value <0.001. This is in line with the results of a previous

study done in Cote d' Ivoire ²³ which also revealed that majority of the children with severe illness had two or more concurrent clinical conditions. More than one disease syndromes occurring in a child, with their combined effects, may be debilitating and this may explain the finding in our study that the children with more than one diagnosis were sicker than children with one diagnosis.

In this study the mean time duration of illness from symptoms onset to the time of seeking treatment was 4 days for children with general danger signs (cases) versus 3 days for children without general danger signs. This time difference was statistically significant, p-value <0.001, suggesting that delay in care seeking leads to severe forms of disease. This delay leads to loss of precious time for prompt diagnosis and timely initiation of treatment. This finding is consistent with findings of several studies that found that the perceived severity of illness influences decision to seek care ^{32, 33, 34, 35}. Other studies ³⁶ have demonstrated the effects of delayed care-seeking on outcome of illnesses in children.

Using univariate analysis, eating of cold leftover food appeared to be significantly associated with presence of general danger signs but when subjected to multivariate logistic regression analysis, the statistical significance became weak, (p = 0.052). However, in a study done by Molbak et al in Guinea-Bissau on risk factors for diarrheal diseases in early childhood, there was an increased rate of diarrhoea in children from families who had the practice of eating cold leftovers ²². Children at risk of developing severe diarrhoea may be the same children who are at risk of presenting with severe illness with any of the diseases that are major causes of morbidity and mortality in children ²³.

The significant finding, in univariate analysis, that children who had stopped breastfeeding before six months of age had 1.8 times (95% CI=1.3-3.3) odds of presenting with general danger signs that of exclusively breastfed infants, was lost on multivariate logistic regression analysis, ($p = 0.193$). This was in contrast to the findings in other studies where lack or discontinuation of breastfeeding in young infants contributed to development of severe acute lower respiratory tract infections^{14, 15}. This means that the act of stopping breastfeeding before six months of age was not an independent risk factor for development of general danger signs in our study children.

Child-specific factors such as age and birth order, in our study, were not associated with presence of general danger signs, $p = 0.636$ and $p = 0.361$ respectively. Birth order categories in this study were; first birth order, second birth order and third birth order and above. In univariate analysis, there was no statistical difference across the different birth orders in both cases and controls. KDHS 2008-2009 however reported that higher-order births are at increased risk of death⁶. Although KDHS did not specifically report whether higher-birth order was associated with presence of general danger signs, we drew this comparison because children with general danger signs are at risk of death if not promptly treated. However, our finding is supported by a meta-analytic study done by Stewart J et al whose study findings showed no association between birth order ≥ 3 and severity of illness due to acute lower respiratory infections³⁷.

As regards mother's education level, there was no association between lack of formal education in a mother and presence of general danger signs in a child. It should be noted however, that mothers who had no formal education were uniformly few in both cases (3% and controls (2%) in our study. Majority of the mothers in our study had completed either primary or secondary school education and their number was almost the same in cases and control, with no association with presence of general danger signs, $p = 0.646$. Several studies show that seven or more years

of school education reduces a child's risk of severe disease and thus improved survival ^{6, 12, 13}. This, together with the low number of mothers who had no formal education in the current study, would probably explain why the education level had no association with presence of general danger signs.

9. STUDY LIMITATION

This was a level 6, site-specific study; and therefore, it is difficult to generalize the results to patients in other health facilities. However, there is reason to make recommendations basing on the independent factors that were found to be associated with general danger signs owing to the fact that other studies done elsewhere came up with similar results.

10. CONCLUSION

1. This study shows that socioeconomic factors such as use of biomass as a cooking fuel source is associated with presence of general danger signs in children with acute severe illness.
2. Severe pneumonia and having more than one diagnosis in a child were the clinical factors associated with presence of general danger signs.
3. Presentation to hospital for treatment later than 3 days was also associated with presence of general danger signs.

11. RECOMMENDATIONS

1. Use of cleaner fuels such as natural gas and electricity is recommended over biomass.
2. Integrated approach to management of children who present with general danger signs is of utmost importance to deal with the multiple illnesses.
3. There is need to educate parents/caregivers and communities about simple signs of diseases that suggest a need for seeking professional medical attention.

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13. APPENDICES

Appendix I. Screening tool for study subjects

(Adapted from WHO IMCI Guidelines).

I. Children with general danger signs:

1. Age _____

2. Sex _____

3. General danger signs including: Cases (Tick as appropriate)

- Child is unable to drink or breastfeed
- Child vomits everything
- Child has convulsions now
- Child has altered level of consciousness

II. Children with severe illness (include signs other than the four general danger signs:

Controls

- Lower chest wall retraction
- Stridor
- Abnormal skin turgor
- Sunken eyes
- Severe palmer and/or conjunctival pallor
- Temperature above 38.5 °c

Unknown

7. Age of mother (in years)

8. Age of father (in years)

9. Have a mobile phone 1= yes 2= no

10. Listen to health related talks on TV / radio Often

Rarely

Never

11. Reading news papers: Often

Rarely

Never

12. Floor 1=cement

2= mud

13. Walls 1=brick 2= mud

14. Number of rooms =1 =2 >2

15. Number of people living in house =2 =3 =4 =5 ≥5

16. Cooking fuel category: 1= Charcoal /Wood 2 = Natural gas 3= Electricity

4= Kerosene/Paraffin

17. Water supply Running tap water in house

Running tap water in compound

Water vendors

Other e.g. well or river (specify)

18. Eating of cold leftovers 1=Yes 2= No

19. Sanitation Flush toilet in house

Latrine in compound

Outside shared facility e.g. council facility

20. Breast feeding Exclusive Partial Weaned

21. Mother's occupation

- Unemployed
- Informal O = farming, O = business, O = artisan
- Formal (wage employment)
 - O 1= < 5000 KES per month
 - O 2= 5000-10000 KES per month
 - O 3= 11000-20000 KES per month
 - O 4= > 20000 KES per month
- Not applicable

22. Does the mother have access to funds for transport fee?

- Always
- Often
- Rarely
- Never

23. Father's occupation

- Unemployed
- Informal O Farming O business O artisan
- Formal (wage employment)
 - O 1= < 5000 KES per month
 - O 2= 5000-10000 KES per month
 - O 3= 11000-20000 KES per month
 - O 4= > 20000 KES per month
- Not applicable

24. Mother's education

- = None

- = Part primary
- = Completed primary
- = Part secondary
- = Completed secondary
- = Tertiary
- =Not applicable

25. Father's education

- = None
- = Part primary
- = Completed primary
- = Part secondary
- = Completed secondary
- =Tertiary
- = Not applicable

26. Does the family have insurance cover? 1 = yes 2 = No

27. If yes in number 26, does it cover, inpatient services only
 Outpatient services only
 Both inpatient and outpatients services

28. Has the caregiver previously been admitted at KNH with this child? 1= Yes 2= No

29. Has the caregiver previously been admitted at KNH with another child? 1=yes 2=No

30. Caregiver attends health education sessions in well baby clinics.

- Regularly
- Rarely
- Never

31. Place of residence

- Nairobi
- Other urban (clarify)-----
- Rural

32. Religion
- Christian
 - Muslim
 - Traditional
 - Other (specify) _____

B. Disease related variables

33. Duration of illness _____(days)

34. Major complaints

- Diarrhoea
- Vomiting
- Cough
- Difficulty breathing
- Pain
- Hotness of body
- Swelling of the feet
- Wasting
- Convulsions
- Refusal to feed
- Difficult arousing
- Other (specify)_____

35. Referral

- Referred from another health facility?
- Self referral?

36. If referred,;

- From private hospital
- From private clinic
- From provincial General Hospital
- From District hospital
- From city council health centre

37. Route for care seeking

- Home → KNH
- Home → private clinic →KNH
- Home → other public health center →KNH
- Home → pharmacy → KNH
- Home → shop → KNH
- Home → traditional healer /herbal meds → KNH
- Other (specify)_____

38. Did you buy medicine from a local shop/kioski as one of the steps before arrival to health facility when you realized your child was sick?

- Yes If yes, state name of drug(s) -----
- No

39. Immunization card produced? Yes No (If yes skip number 41)

40. Immunization schedule as per card complete not complete up to date

41. Has your child received immunization? Yes No don't know

42.CLINICAL SIGNS AND SYMPTOMS: Adapted from the KNH Paediatrics admission form.											
WEIGHT.....			AGE.....			HEIGHT-----			Z-SCORE-----		
HISTORY					EXAMINATION						
SYMPTOMS				DURATI ON IN DAYS							
Fever	Y	N			Breathing	Respiratory rate for 1 minute		/Min		
Cough	Y	N				Central cyanosis			Y	N	
Difficulty Breathing	Y	N				Lower chest wall in drawing			Y	N	
Temp °C (axillary)	-----					Grunting			Y	N	
						Wheeze			Y	N	
					Circulation	Pulse		Weak	Normal/Min	
						Cap.refill		No shock		Shock	
						Pallor/Anemia		0	+	+++	
					Dehydration	Sunken eyes		Y	N		
Bloody diarrhoea	Y	N				Skin pinch		0	1	2	> 3sec
Convulsions during this illness	Y	N			Disability	AVPU		A	V	P	U
Diarrhoea	Y	N				Can drink/BF		Y		N	
Difficulty feeding	Y	N				Bulging fontanel		Y		N	
Vomits everything	Y	N				Can sit-up alone		Y		N	
					*Duration of admission as per discharge notes----- -----						
*Admission diagnosis-----					*Outcome on discharge: 1. Alive 2. Dead						

Appendix III. Consent Form

Patient's study Number: -----

Date:-----

Study Title: Risk factors associated with presence of general danger signs in children presenting with acute severe illness at Kenyatta National Hospital.

Investigator: Dr. Kalisa Michael (MB ChB), Paediatric Resident, University of Nairobi.

Cell phone: 0717-039905

Supervisors: 1. Prof. Francis E. Onyango(MB ChB), MMed (Paeds), MPH, Department of Paediatrics and Child health, University of Nairobi.

2. Dr. Christine Y. Jowi (MB ChB), MMed (Paeds), Masters in Cardiology, Senior lecturer, Department of Paediatrics and Child health, University of Nairobi.

3. Dr. Grace Irimu (MB ChB) MMed (Paeds) PhD, Senior lecturer, Department of Paediatrics and Child health, University of Nairobi.

Investigator's statement:

I am asking you and your child to kindly participate in this study. The purpose of this consent form is to provide you with the information you will need to help you decide whether or not to participate in the study.

Introduction:

Many children presenting at Kenyatta National Hospital for treatment come with severe illness, the aim of the study being carried out is to find out the issues that affect the severity of children's illness and how much that relates to the diseases they are suffering from. You will be asked a number of questions that will take on average about 20 minutes of your time. Your child will be examined to determine the nature and severity of his/her illness. No laboratory tests relating to this study will be carried out on your child, and all the care he/she needs will not be interrupted by your agreement to participate in the study.

Benefits:

The results of the study will help doctors understand better issues that make children's illness severe and liaise with other healthcare stakeholders to plan interventions that address these issues for better health of the children in future.

Risks:

No direct or indirect risks are anticipated in this study. Only a bit of your precious time will be taken by the interviewer. The care of your child is paramount all the time.

Voluntariness:

Participation in the study will be fully voluntary. You are free to refuse to participate or withdraw from the study at any time. Refusal to participate in the study will not compromise your child's care in the hospital in any way. There will be no financial reward to you for participating in the study.

Confidentiality:

The information obtained about you and your child will be treated with utmost confidence and information to identify you or your child will not be released to any person or forum without your permission.

Questions:

If you ever have any questions regarding the study you can contact the investigator, Dr. KALISA Michael, Tel: 0717-039905.

Or Kenyatta National Hospital/ University of Nairobi Ethical Review Committee,

Tel: 726300-9

Participant's statement:

I _____ having received adequate information regarding the study research, risks, benefits hereby AGREE to participate in the study with my child. I understand that our participation is fully voluntary and that I am free to withdraw at any time. I have been given adequate opportunity to ask questions and seek clarification on the study and these have been addressed satisfactorily.

Parent/Caretaker's Signature: _____ Date _____

I _____ declare that I have adequately explained to the above participant, the study procedure, risks, and benefits and given him /her time to ask questions and seek clarification regarding the study. I have answered all the questions raised to the best of my ability.

Interviewer's Signature _____ Date _____

Consent form (Swahili version)

FOMU YA RIDHAA KUSHIRIKI UTAFITI

Salaaam!: Mimi naitwa Dr. KALISA Michael, nimwanafunzi wa shahada ya uzamili Chuo Kikuu cha Nairobi. Nafanya utafiti kama nilivyoeleza hapo chini.

Nia ya utafiti: Kubaini vihatarishi vinavyo ambatana na magonjwa makali ya ghafla miongoni mwa watoto wanaohudhuria kitengo cha magonjwa yadharura katika Hospitali ya Taifa Kenyatta.

Jinsi ya kushiriki: Kushiriki katika utafiti huu ni ihari yako unaweza kukubali au kukataa, na hata ukikataa bado mtoto atapata huduma zinazotolewa hospitalini hapa kama kawaida.

Ushiriki wako: Kama utakubali kushiriki utaulizwa maswali machache baada ya mtoto kupata nafuu kidogo.

Faida za kushiriki: Hakuna faida yamoja kwa moja kwa wewe kushiriki katika utafiti huu, labda kusaidia madaktari kubaini vihatarishi vinavyoambatana na magonjwa makali ya ghafla kwa watoto ili kuweza kutafuta suluhisho lake mapema.

Utunzaji wa siri: Taarifa utakazozitoa hapa kuhusu wewe au motto zitatumzwa vizuri bila kushirikisha wale wasiostahili.

Mimi, nimeelezwa na nimesoma maelezo haya. Maswali yangu yamejibiwa.

Nimekubali mimi na mwanangu kushiriki kwenye utafiti huu.

Sahihi ya mzazi/mlezi Tarehe..... **asante.**

Appendix iv: Time frame

The following is a proposed time-frame of the study process:

Number	Activity	Estimated Time
1	Proposal Development and Presentation	November 2011 to Jan 2012
2	Proposal Submission to the department for marking	February 2012
2	Submission of proposal for ethical approval	March 2012
3	Pretesting	August 2012
4	Data Collection	Sept to Nov 2012
5	Data Analysis	December 2012
6	Dissertation writing	Jan to Feb 2013
7	Dissertation submission	February 2013
8	Poster Presentation	March 2013

Appendix V. Study budget:

Category	Remarks	Units	Unit Cost (KShs)	Total (KShs)
Proposal Development	Printing drafts	1000 pages	5	5,000
	Proposal Copies	8 copies	500	4,000
Data Collection	Stationery Packs (Pens, Paper and Study Definitions)	10	100	1,000
	Training research assistants	1 day	1000	1,000
	Research assistants (1)	3 months	7500	22,500
Data Analysis	Statistician	1		20,000
Thesis Write Up	Computer Services			5,000
	Printing drafts	1000 pages	5	5,000
	Printing Thesis	10 copies	500	5,000
Contingency funds				10,000
Total				78,500