Addis Ababa University College of Health Science School of Public Health

PREVALENCE AND ASSOCIATED FACTORS OF ACUTE LOWER RESPIRATORY INFECTION AMONG UNDER FIVE CHILDREN, YEKA SUB CITY, ADDIS ABEBA, ETHIOPIA.

A thesis Submitted To the School of Graduate Studies of Addis Ababa University, College of Health Sciences, School of Public Health in Partial Fulfillment of the Requirements for the Degree of Master in Public Heath

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June, 2017

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Thesis Report Declaration

I, the under signed, declared that this is my original work, has never been presented in this or any other University and that all the resources and materials used for the thesis work, have been fully acknowledged.

Name of student: _____Signature: _____Date: _____

This thesis has been submitted for examination with my approval as the student thesis work advisor.

Name of advisor: _____Signature: _____Date: _____

Acknowledgments

I praise Almighty God for giving me the courage and resilience to complete this work. The completion of this thesis represents a great achievement in my life in which the contribution of many people was enormous and thus deserve acknowledgement. First of all I would like to express my deepest gratitude to Dr. Ababi Zergaw for his unreserved and invaluable advice and comment from the development of proposal to the end of the research. I would also like to extend my deepest gratitude to all those, especially to my father Wogderes Begashaw,my beloved sisters Etetu Wogdres and Bezawork Wogderes who assisted me with unreserved effort since the death of my mother at early child hood. I also owe a debt of gratitude to all institutions and individuals directly or indirectly contributed to accomplishment of my thesis.

I thank you all!

Dedications

This paper is dedicated to all under five children living Yeka subcity, Addis Ababa, Ethiopia.

ACRONYMS AND ABBREVIATIONS

ARI……Acute Respiratory Infection

AA……Addis Abeba

AOR……..Adjusted Odds Ratio

ALRI…….. Acute Lower Respiratory Infection

COR…….. Crude Odds Ratio

BSc……Bachelor of Science

CI……..Confidence Interval

HSTP……...Health Sector Transformation Plan

HO…….Health Officer

HH…….House Hold

IMNCI…...Integrated Management of Newborn and Childhood Illness

IgG……Immunoglobulin

m……..month

MUAC…..Mid Upper Arm Circumference

OPD……..Outpatient Department

OR…….. Odds Ratio

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ABSTRACT

Background: Acute lower respiratory tract infections in developing countries cause considerable morbidity, hospitalization and mortality in children aged under five years. In Ethiopia acute respiratory infection is the leading causes of under-five mortality which accounts for 18% of total death among under five children.

Objective: To assess risk factors associated with acute lower respiratory infection among under five children in Yeka sub city, Addis Abeba, Ethiopia.

Methods: community based cross-sectional study was conducted with a sample size of 447. Data was collected by interview, entered to EPI data version 3.1, and was exported to SPSS version 22 for analysis. Descriptive statistics using frequencies, proportion and tables were used to present the study results. Binary logistic regression analysis was employed to see association between acute lower respiratory infection and different risk factors. To evaluate the association and adjusted odds ratio with 95% confidence interval were computed.

Results: The prevalence of acute lower respiratory tract infection was 4.6%. Evidence from this study also showed that house hold with window (AOR=0.2, 95% CI: 0.1-0.6, p-value=0.002) and family size of less than five children (AOR=0.1, 95% CI: 0.01-0.6, p-value=0.01) were preventive risk factors.

Conclusions and recommendations: The prevalence of acute lower respiratory infection was low. This study has demonstrated that the preventive factors for acute lower respiratory infection were maternal education to primary or secondary level, household with window and less than five children in the household. These risk factors can be modified by encouraging and increasing community awareness for child spacing and increase and promote female education.

1. INTRODUCTION

1.1 BACKGROUND

Acute lower respiratory infections are a leading cause of sickness and mortality both in children and adults worldwide, consequently global health-care agencies such as the World Health Organization (WHO), United Nations Children's Fund (UNICEF), national and state Governments, as well as international and local agencies involved with aid, academics, and research- have all focused on this area(1). Approximately 20% of deaths are estimated to occur in India alone; 43% in India, Nigeria, the Democratic Republic of Congo and Ethiopia; and 70% in 15 countries of which 10 are in Africa, three in the Indian subcontinent and two (China and Afghanistan) in Asia..For pneumococcus, ten countries were modeled to account for 66% of all pneumococcal cases (of which 96% were pneumonia) including India (27%), China (12%), Nigeria (5%), Pakistan (5%), Bangladesh (4%), Indonesia (3%), Ethiopia (3%), the Democratic Republic of Congo (3%), Kenya (2%) and the Philippines (2%) (2). Many of these countries are included in this list primarily because of the large birth cohort size. The effect of this is that although India had both the highest estimated number of ALRI cases and deaths, the next three countries with the greatest number of ALRI deaths were African, and included Nigeria, Ethiopia, and the Democratic Republic of Congo. Data on Hib were approximately similar. All countries with a modeled Hib mortality rate of at least 200 per 100,000 per year were African except Afghanistan; Nigeria, Ethiopia and the Democratic Republic of the Congo followed India as the countries with the greatest predicted number of Hib deaths. For RSV, over 91% of deaths were estimated to occur in developing countries (3).

ALRI are caused by a number of infective agents, with Streptococcus pneumoniae being generally the most frequently identified bacterial agent, and Respiratory Syncytial Virus being the most frequent viral agent (4). A large number of factors determine whether the contact with an etiologic agent will result in a severe episode of ALRI, and whether the episode will result in death. Some of these factors are related to

the child (e.g. age, sex, and underlying diseases), others to the disease (e.g. type of infection), others may be related to the environment, the family and its socio-economic status, or to the health system and type of care (5).

1.2 **STATEMENT OF PROBLEM**

Acute lower respiratory infection is a common disease of childhood all over the world (6). About one in five was caused by an acute lower respiratory infection of 6.9 million children died in 2011 worldwide (7).Especially in developing counties, it cause considerable morbidity, hospitalization and mortality in children aged under five years (8).On average, children below 5 years of age suffer five episodes of ALRI in a single year, which makes up 50% of all pediatric visits and 30% of all admissions in developing counties (9). In Ethiopia, about 190, 000 children are still dying each year, although Ethiopia has achieved MDG 4 target three years earlier by reducing under-five mortality by 67% from the 1990 estimate. It is ARI (ALRI most common cause) the leading causes of under-five mortality which accounts for 18% of total death among under five children. (10)

The identified risk factors for this morbidity and mortality from acute lower respiratory tract infections of children under 5 years of age include heavy reliance on solid fuels for household energy for cooking, overcrowding (11,12) and house made of mud (13). Studies also showed that children exposed to ciggarate smoking (12), low birth weight children (14, 15, 16), being male children (15, 16,), malnourished children (13, 14, 16) and children from illiterate parents are at risk of ALRI. On the other hand, studies suggested that low birth order (13) and exclusive breast feeding (13, 14) reduce the probability of occurrence of ALRI in under five children.

Controlling the continued threat of ALRI is one of the major health priority of the government of Ethiopia for which this study will contribute its part. Despite the sustained effort to stop the problem, ALRI continue

to kill thousands of children in Ethiopia which calls for innovative strategies that will come about only through systematic researches.

Above all, there were previous studies have been conducted in Ethiopia to identify and quantify the various risk factors for ARI. Most of these studies focused more on ARI than on ALRI. Therefore, this study attempted to identify associated factors of acute lower respiratory-tract infections among children under five years of age in Yeka sub city, Addis Abeba, Ethiopia.

1.3 **Significance of the study**

Identifying factors associated with acute lower respiratory infection in under five children will help health extension workers, health managers and policy makers in designing appropriate intervention to improve health status of under five children. Also, the result will be used as body of information for further large scale studies on the same problem.

1.4 LITERATURE REVIEW

1.4.1 MORBIDITY AND MORTALITY BURDEN OF ACUTE LOWER RESPIRATORY INFECTION

Acute lower respiratory infections (ALRI), such as pneumonia and bronchiolitis, are the leading cause of morbidity and mortality in children under five years of age. According to recent estimates, every year about 120–156 million cases of ALRI occur globally with approximately 1.4 million resulting in death. More than 95% of these deaths occur in low and middle income countries (LMIC) (17, 18). The situation in sub-Saharan Africa is especially grave with around 378, 000 ALRI deaths occurring in this region alone (19) .Ninety-seven percent of ALRI cases occur in the developing world with seventy percent of those cases occurring in south Asia and sub-Saharan Africa alone (20).The study done in Brazil 23.9% under five children had acute lower respiratory infection (21). Study done in Rwanda also showed that ALRI among under five children was observed to be 4 %(7).

1.4.2 DETERMINANTS (FACTORS) OF ACUTE LOWER RESPIRATORY INFECTION

1.4.2.1 SANITATION RELATED FACTORS

Over the past century, hygiene improvements at the individual and community level such as sanitary living conditions and practices, potable water, and sewage facilities have had a major role in reducing morbidity and mortality from infections , particularly those transmitted by the faecal-oral and direct contact routes. In developing countries, infections carry an even greater burden of morbidity and mortality, especially in areas where `public health infrastructure and medical care are inadequate or unavailable (22). The study done in Rwanda showed that a toilet type were associated with ALRI (7).

1.4.2.2 CHILD RELATED FACTORS

Multiple child related factors determine the frequency and nature of acute lower respiratory infection. Malnutrition and infection have a vicious circle, infection and disease impair the nutrition process and poor nutrition result in infection. The frequency of acute lower respiratory infection is also different for male and female children.

BREAST FEEDING: - While breastfeeding is important for all infants, it becomes vital in situations of emergency where access to clean water and adequate nutrition is limited (23). The study done in Netherlands has examined that compared with never-breastfed infants, those who were breastfed exclusively until the age of 4 months and partially thereafter had lower risks of infections in LRTI until the age of 6 months (AOR: 0.50, CI: 0.32–0.79] and of LRTI infections between the ages of 7 and 12 months (AOR: 0.46, CI: 0.31–0.69) (24). Cohort study done in Chile also showed that significantly higher percentages of children born to mothers with less than eight years of schooling, experiencing poor living conditions were found to have experienced two or more ALRI episodes; and all of these groups plus those with one or more siblings, those breast-fed less than 4 months, experienced four or more ALRI episodes (25).

CHILD AGE: - While the study done in Rwanda showed that ALRI was particularly high among children less than two years (0–11 months: 5.2 %; 12–23 months: 5.1 %) (7). A lancet systematic analysis also has examined that ALRI incidence was highest in neonates aged 0–27 days and infants aged 0–11 months (17). The study done in Butajira also showed that the peak incidences of acute lower respiratory infection were higher among children aged between 1-6 months (26).

CHILD NUTRITIONAL STATUS: - There is evidence that the susceptibility of malnourished children to respiratory infections caused by encapsulated bacteria is due to defects in the production of IgG antibodies (27). Estimation of the global burden of child mortality attributable to under nutrition has played a crucial role in refocusing the attention of researchers and policy-makers on the importance of optimal maternal–child nutrition for promoting neonatal, infant and child survival including the prevention of mortality due to severe acute lower respiratory infection (ALRI)(28). According to study done in Enugu southeast Nigeria Pneumonia was noted in about 75.7% (56/74) of inadequately nourished children compared to 22.6% (82/362) in adequately nourished children. (29)

BIRTH ORDER AND BIRTH INTERVAL: - Evidence from Ethiopian demographic and health survey showed that children born less than two years after the preceding birth are 2.5 times as likely to die within the first year of life and within the first five years of life as children born three years after the preceding birth (26). Previous evidence on child health and birth order done in Denish showed that firstborn children are disadvantaged at birth with worse health (30). Evidence from Nigeria demographic and health survey also revealed that likelihood of under-five mortality among the siblings of mothers with a preceding birth interval of 18-36 months and > 36 months reduced by 51% and 70% respectively compared to mothers with a preceding birth interval of < 18 months (31).

CHILD SEX:-Study done in Brazil examined that males are more likely to develop lower respiratory tract infections than females (32). Study done in Hatay city also examined that LRI risk of male children were found to be 1.83 times increased against female children (33).

1.4.2.3 SOCIOECONOMIC STATUS RELATED FACTORS

FAMILY OCCUPATION: - Diagram-based Analysis of Causal Systems in sub-Saharan Africa found that education and occupation exert their influence on proximal health risks through at least partly independent pathways, and that some dimensions of socio-economic status, in particular material circumstances and related purchasing power, play a greater role in determining risk factor profiles than others. Solid fuel use and vaccination emerge as particularly strongly structured by socio-economic variables (34). The study done in Ethiopia showed that maternal occupation had a statistically significant association with ARI; accordingly, compared with children of unemployed mothers, children whose mothers were professionals had a 90% reduced odds of having ARI (adjusted OR 0.1; 95% CI 0.01–0.6)(35). The study done in India have produced evidence that on multivariate logistic regression analysis, low socio-economic status (OR 4.89, 95% CI 1.93–12.36), were found to be significant risk factors (8).

FAMILY EDUCATION: - A father's literacy has an impact on childhood pneumonia; a higher-class level resulted in a diminished risk of pneumonia. A child whose father did not finish primary school (1 - 4) and (5 - 8) is 10.7 (AOR = 10.7, 95%CI: 2.69, 42.7) and 4.67 (AOR = 4.67, 95%CI: 1.2, 17.9) times more likely to develop pneumonia as compared to child whose father received higher education (7).While the study done in Brazil has examined that Risk of acute lower respiratory illness was 65% greater for children of mothers with lower schooling as compared to children of mothers with ≥ 9 complete years (21).Study done in Hatay city examined that LRTI risk of children whose mothers took education less than 8 years was 2.07 times increased than children whose mothers have educated for more than 8 years (33).

1.4.2.4 FACTORS RELATED TO HOUSE HOLD SITUATION

FAMILY SIZE: -The study done in India has examined that families having more than two under five children at home were significantly associated with ALRI (7). A systematic review and meta-analysis

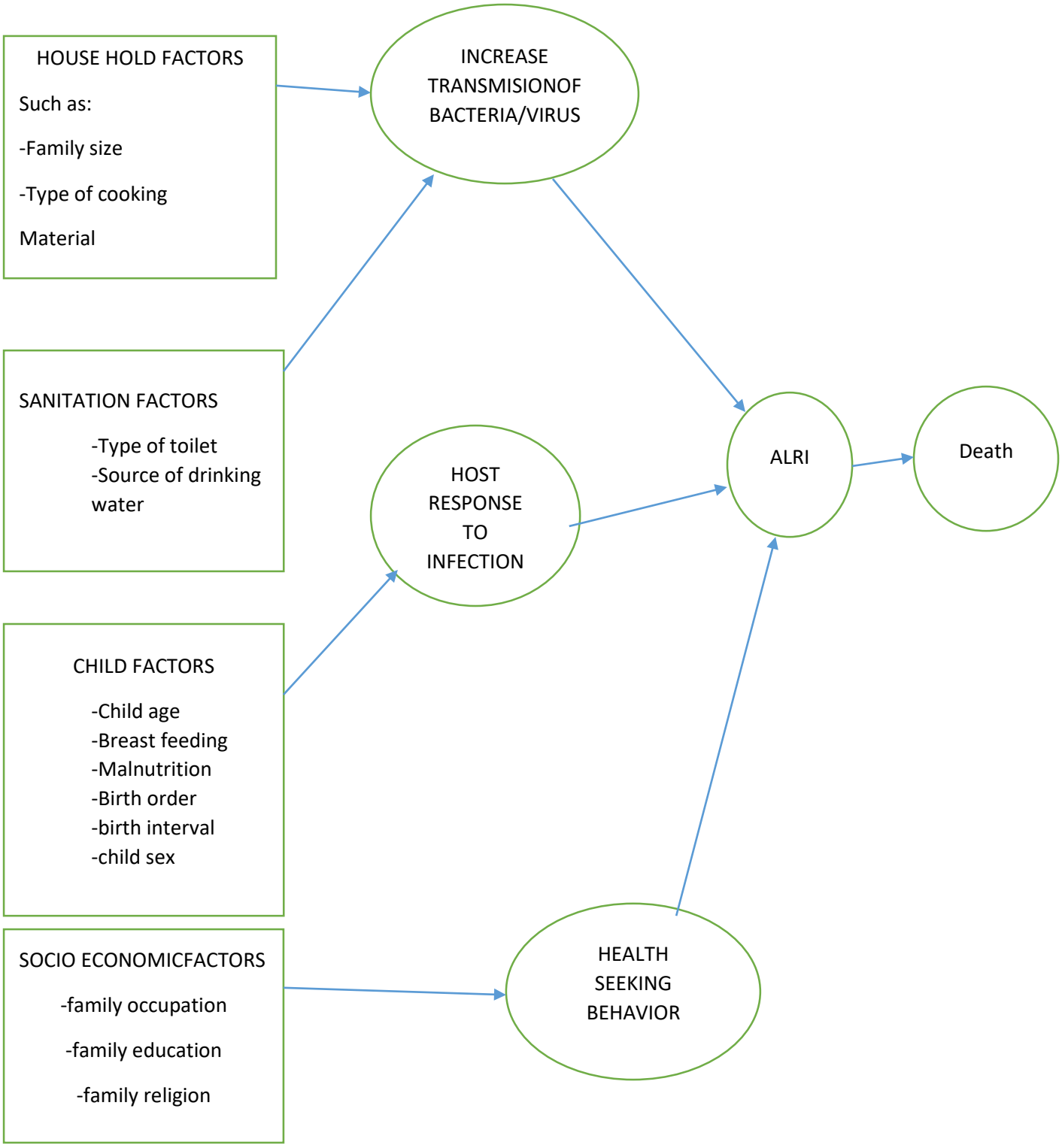
reported summary estimate of the odds ratio for the developing region was 1.9 (95% CI 1.5 to 2.5) for the relationship between crowding and severe ALRI (38).The study done in Este, Ethiopia revealed that children who live in severely crowded house were more likely to have pneumonia with statistically significant difference than children who lived in under crowded house (AOR=4.057, 95% CI: 1.173-14.031) (39).

TYPE OF COOKING MATERIAL: - Indoor air pollution emanating from burning solid fuels (wood, charcoal, animal dung, coal and crop waste) for cooking and home heating remains a major environmental and public health challenge in developing countries. Worldwide, approximately 4.3 million people have died as a result of illnesses attributed indoor air pollution; these deaths include 534,000 children <5 years of age (40).The study done in Nepal have produced evidence that the OR for kerosene primary stoves, compared with electric stoves (2.33; 95% CI: 1.40, 3.86), is comparable to or greater than that for biomass stoves (2.13; 95% CI: 1.34, 3.41) (41). A meta-analysis of 24 studies also produced a summary estimate of 1.78 (95% CI: 1.45, 2.18) for the relationship between household use of solid fuels (wood, dung, charcoal, and coal), relative to use of fuels considered "clean" (electricity, gas, or kerosene), and ALRI in children under five years of age (42). In contrast study done in Rwanda showed that type of cooking fuel was not associated with ALRI (7).

CIGARETTE SMOKING AND PRESENCE OF WINDOW: - The study done in Hatay city revealed that exposing second hand smoke had 2.63 fold risks in patients with LRTI (33).Cigarette smoke combustion products reportedly increase morbidity and mortality in acute respiratory infections by impairing physical defenses in the respiratory tract, and by impairing cellular and humeral immune responses to microbes (43). The 2006 US Surgeon General's report on the effects of involuntary exposure to tobacco smoke also concluded that passive smoking was a cause of a range of diseases of children, including acute lower respiratory infection (LRI) (44).The study done in Nepal have produced evidence

that on multivariate logistic regression analysis, presence of window (AOR 0.39, 95% CI 0.18–0.8) were found to be significant risk factors (45).

The literatures reviewed above had some differences with each other's in terms of study design and sampling techniques, operational definition of ALRI, variables included in to the study, the setting where the study were done and analysis technique employed . Based on the findings from all relevant reviewed literatures family education and occupation, family size, child age and sex, cigar rate smoking and child malnutrion were consistently found to be risk factor of ALRI, which showed different degree of association with ALRI across the studies. While some other risk factor like cooking material used were not consistently found to be risk factor of ALRI, in some study it was risk while in other study that was not a case in the other. The present study expected to clear the evidence that whether cooking material used is associated with acute lower respiratory infection or not.



Figur1. Conceptual model postulating determinants of ALRI in children (46)

2. **Objectives of the study**

2.1 **General objective**

To assess the prevalence and risk factors of acute lower respiratory infection among under five children in Yeka sub city, Addis Abeba, Ethiopia .

2.2 **Specific objectives**

- To determine the prevalence of acute lower respiratory infection among under five children in Yeka sub city, Addis abeba, Ethiopia.
- To identify factors associated with acute lower respiratory infection among under five children in Yeka sub city, Addis Abeba, Ethiopia

3. **Methodology**

3.1 **Study Area and period**

Yeka is one of the ten sub cities in AA administration. It is situated in north part of Addis Abeba, bounded from south by Bole sub city, from west by Lideta sub city and from north and east by Oromia region. At present, the sub city divided into thirteen woredas and hundred twenty four sub woredas. According to 2007 census, the total population of this sub city is 346,486(47). Based on the sub city health department, the sub city has a total of 433,672 under five children (48). There are thirteen health center and seventy five different level private clinics which deliver routine health services to the sub city community. The water supply in the sub city are reservoir and bono water points eleven and six respectively (47). The study was conducted from September to April in Yeka sub city,Addis Abeba.

3.2 **Study Design**

A community based descriptive quantitative cross-sectional study design was conducted in Yeka sub city, Addis Abeba.

3.3 **Target and Study Population**

The Target populations for this study were all under five children in Yeka sub city, Addis Ababa. The study population were all under five children in the selected ketenas, woredas.

3.4 **Sample size determination**

Sample size (n) was calculated by using single population proportion formula. As it shows in table below prevalence of ALRI for each risk factor and over all prevalence (4%) in the study done in Rwanda is low (6), Therefore, over all prevalence (no prevalence for each risk factor) of ALRI (23.9%) was taken to calculate sample size from the study done among under five children in Brazil (20), the margin of error (d)

5% and taking confidence interval (zα/2) of 95%. Where n is sample size, p is prevale4nce (0.217), and d is margin of error/level of precision (0.05).

$n = z^2P(1-P) = (1.96)^2 0.239(1-0.239) / (0.05)^2$

d^2

$=279$

To adjust the variability taking design effect (due to multi stage sampling technique) of 1.5 and non-response rate of 10%

$N = 279 \times 1.5 + (10\%) = 447$ is final sample size

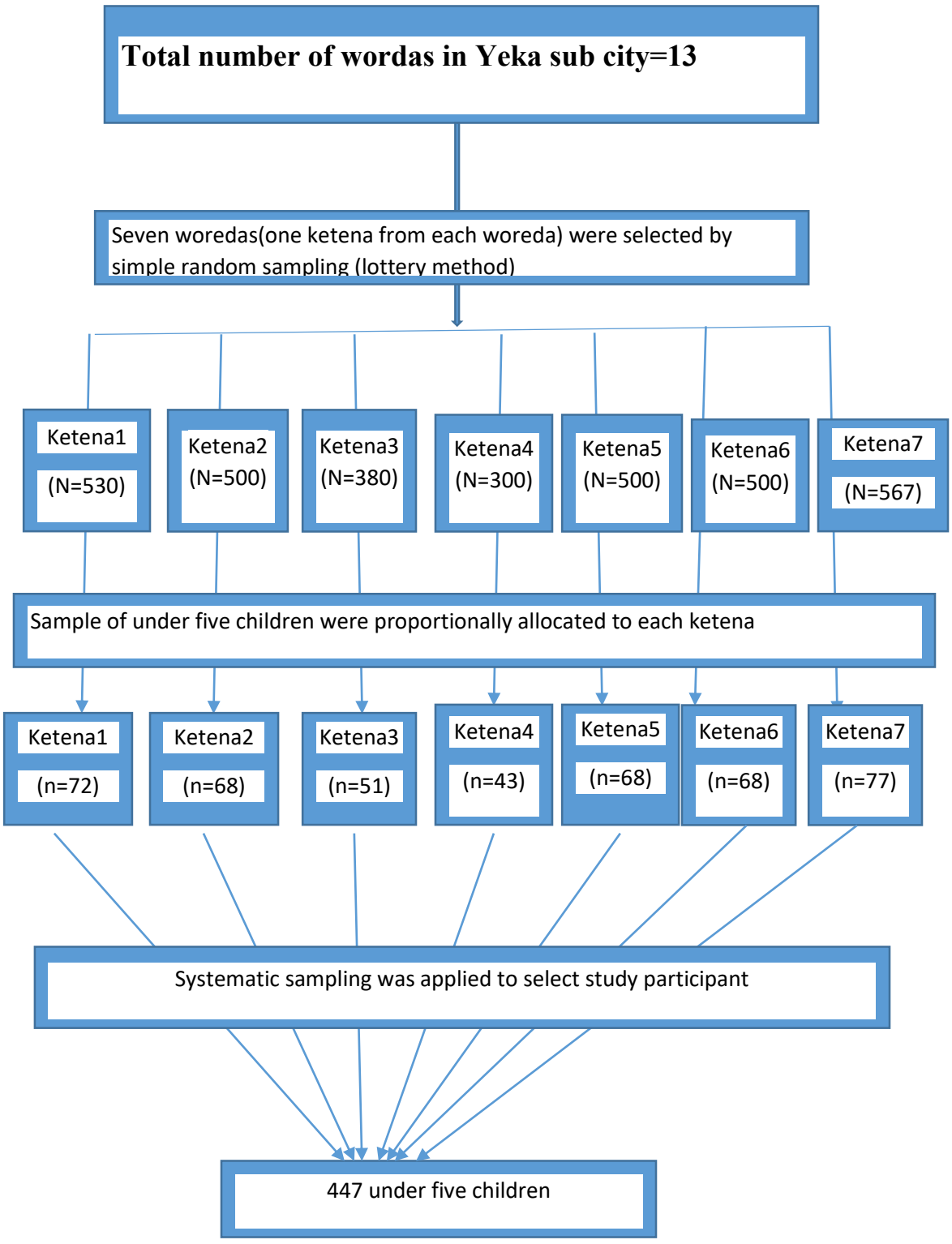
Table 1: The prevalence and sample size for each risk factors from previous study

Variables/risk factors	Prevalence (Sample size)	Variables/risk factors	Prevalence (Sample size)
Male Children	4.1%(60)	Child age (0–11 months)	5.2%(75)
Mother education (less than secondary)	3.6%(53)	Child age (12m – 23m)	5.1%(74)
Mother occupation(employed)	4.6%(67)	Family size(greater than five)	4 %(59)
Biomass fuel (fuel wood, dung ,charcoal)	3.6% (53)	Source of drinking water (unimproved	4.1%(60)

3.5 **Sampling Procedures**

A two stage sampling technique was used. At the first stage among thirteen woredas seven woredas (because of large sample size and to make more representative) were randomly selected using lottery method then in the second stage from the selected woredas seven ketenas were selected. The study unit (household with under five children) in selected ketenas was selected using systematic random sampling for a final sample. When systematically selected house hold had no under five children the consecutive selected HH was taken until the required sample allocated for each Ketena achieved.

Figure 2. Schematic presentation of sampling procedures in the selection of households having under five children. Where 'N' means house hold size and 'n' the number of under five children.



3.6 **Inclusion and Exclusion Criteria**

3.6.1 **Inclusion criteria**

All under five children present during data collection

3.6.2 **Exclusion criteria**

- Critically ill children- a child had any of the following signs and symptoms
    - convulsion at time of data collection
    - vomiting everything
    - unable to breast feed or drink
    - lethargic/unconsciousness
- Children with congenital problem -a child had any visible congenital birth defect (eye, ear, face, neck and musculo-skeletal defects) or had history of follow up from physician for any birth defect.
- The under-five child mother present as guest during data collection.

3.7 Study Variables

3.7.1 **Dependent Variables**

Acute lower respiratory infection

3.7.2 **Independent Variables**

- **Child related factor:**

- child age
- child sex
- child malnutrition

- breast feeding
- birth interval
- birth order

socioeconomic factor:

- family occupation and
- family education

House related factor:

- family size
- cigarette smoking
- cooking material and

Sanitation factor:

- source of drinking water
- type of latrine

3.8 **Data Collection Procedures**

The data was collected by seven community health extension workers and collected by interview technique from the mother of the child. When within the same household more than one child was present, one of them was selected randomly in the study. Mothers in the household with under five children who were absent during the first day of data collection were interviewed in the next visit day (two visit days) until the final visit day of data collection. Data to assess malnutrition status of child was collected using MUAC for child above or equal to 6 months.

3.9 **Data Quality Assurance**

For data quality control purpose, seven HEW were trained by the principal investigator for two days on interviewing techniques, data recording and supervised by two health officers. The questionnaire was first be translated to Amharic and then back to English for checking consistency. The translated Amharic version questionnaire was pre-tested prior to the actual data collection on respondents outside of the study area and modification of some questions was made based on findings from the pre-test. The collected data was reviewed and checked for completeness before data entry .

3.10 **Data entry and analysis**

The quantitative data was entered in to EPI-Data version 3.1 and analyzed using SPSS version 22 software statistical packages. Descriptive statistics of percentages, mean and frequency distribution using tables and figures was carried out in relation to relevant variables .Bivariate logistic regressions analysis was employed to examine the relationship between the acute lower respiratory infection and selected independent variables. Those variables with observed association (p-value less than 0.1) on bivariate regressions logistic analysis was further treated by multivariate logistic regressions analysis in order to adjust for possible confounders. Odds ratio was computed to assess statistical association, and significance of statistical association was assured using 95% confidence interval and P-value.

3.11 **Operational definitions**

ALRI: a child with cough and/ or fever had rapid breathing or difficulty of breathing (breathlessness or wheezing) within the last two weeks of the interview.

Nutritional status: is the nutritional status of child as measured by MUAC for child greater or equal to six months.

Birth interval: refers to the number of years between the study child and the immediate older child whether alive or died.

Birth order: refers to the number of children were born (both alive and died) before the child.

3.12 **Ethical Considerations**

Before conducting the study ethical clearance was obtained from Addis Ababa University, College of Health Sciences, School of Public Health Research and Ethics Committee (REC). Permission to conduct the study was secured from Yeka sub city health department and from selected woreda administrative office. Verbal informed consent was obtained from each study participants after clear explanation about the purpose of the study, the importance of their participation, confidentiality of the information, participation is voluntary and refusal to participate had no effect on the subject or any family member.

3.13 **Plan of dissemination of results**

The results of this study will be presented to Addis Ababa University, College of Health Science, School of Public Health as thesis of Master of Public Health and it will also be distributed to the Yeka sub city health department and other relevant partners. Dissemination can be also done through workshop, conference and if possible through publication in peer reviewed journals.

4. RESULTS

A total of 447 under five children from seven Woredas/Ketena participated in the study giving a response rate of 100%. The overall prevalence of acute lower respiratory infection was 4.6 % (n=21), of which nine (2%) had fast rapid breathing, seven (1.6%) had breathlessness and five (1%) had wheezing.

4.1 **Socioeconomic Characteristics of Respondents**

Regarding educational status of the mother the majority 144 (32.2%) had diploma and above, whereas 126(28.2%) attended primary school, 101(22.6%) secondary school, 41(9.2%) preparatory school, 29(6.5%) can read write and 6(1.3%) were illiterate.

Table 2: Socioeconomic Characteristics of Respondents in Yeka sub city, Addis Abeba, Ethiopia, 2017

Variables	**Frequency**	**Percentage**
Religion		
Orthodox Christian	387	86.6
Muslim	36	8.1
Protestant	23	5.1
Others	1	0.2
Father education (n=423)		
Diploma and above	174	41.1
Secondary	105	24.8
Primary	73	17.3
Preparatory	51	12.1
Read and write	13	3.1

Illiterate	7	1.7
Mother occupation		
Housewife	216	48.3
Government	99	22.1
Private	77	17.2
Laborer	27	6
Business	26	5.8
Others	2	0.4
Father occupation (n=423)		
Private	198	46.8
Government	115	27.2
Laborer	70	16.5
Business	29	6.9
Others	11	2.6

4.2 **Sanitation Characteristics of Respondents**

The greater part of study participants 233 (52.1%) use traditional pit latrine, followed by ventilated improved pit latrine where it accounts 137(30.6%) of latrine use. Only 77 (17.2%) of participants had water carriage latrine as their excreta disposal method. All of the respondents utilize pipe water as source of drinking water.

4.3 **Household Characteristics of Respondents**

The majority of the study participants (n=436, 97.5%) lived in less than five persons per house hold and 11(2.5%) lived five and above persons per house hold. Of the household studied with under five children the majority 417(93.3%) had no cigarette smoker while the rest 30 (6.7%) had smoker of any one of the member of household. The overall average family size of the respondents was five persons per household.

Table 3: Household Characteristics of Respondents in Yeka sub city Addis Abeba, Ethiopia, 2017

Variables	Frequency	Percentage
Has window		
Yes	385	86.1
No	62	13.9
Cooking material		
Electric	311	69.6
Electric and charcoal	95	21.3
Gas/kerosene	26	5.8
Charcoal/wood	15	3.4
Cooking area		
Separate room	168	37.6
Living room	158	35.3
Separate building	120	26.8
Others	1	0.2

4.4**Characteristics of children**

Of 447 study participants almost above half of 234 (52.3%) were males, 88(19.7%) started vaccination and 359(80.3%) fully vaccinated, 55(12.3%) started complementary feeding before six month and 392(87.7%) not started, 1(0.2) had MUAC 11-12cm and 401 (98.8%) had MUAC ≥12cm and while 6(1.3%) taken to day care center and 441(98.7%) were not taken. The mean age studied under five children was 23.83 months.

Table 4: Characteristics of under five children in Yeka sub city, Addis Ababa, Ethiopia, 2017

Variables	**Frequency**	**Percentage**
Age (months)		
<6	42	9.4
6-11	66	14.8
12-23	122	27.3
24-35	100	22.4
36-47	67	15
48-59	50	11.2
Child sex		
Male	234	52.3
Female	213	47.7
Complementary feeding(n=416)		
After 6 months	360	86.5
Before 4 months	31	7.5
Between 4-6 months	25	6

Malnutrition (child age ≥ 6months)		
MUAC ≥12cm	401	98.8
MUAC 11-12cm	1	0.2
Birth order(n=227)		
Below or equal to first	140	61.7
Between second and third	75	33.2
Between fourth and six	10	4.4
Seventh or above	2	0.9
Birth interval (n=227)		
More than three years	179	78.9
Between 2-3 years	30	13.2
Between 1-2years	14	6.2
Less than one year	4	1.8

4.5 **Factors associated with acute lower respiratory infection**

Binary logistic regression was done to identify significant factors associated with acute lower respiratory infection then the significant variables (p-value<0.1) were taken to multiple logistic regression. Binary logistic regression analysis showed that maternal education, family size, cooking material used and presence of window were significantly associated with acute lower respiratory infection of under five children. The study showed no significant association between ALRI of under five children and religion of parents, educational status of father, occupation of mother and father ,toilet type used, smoking expo p-value sure, child age and sex, vaccination status, early complementary feeding and sanitation status of family.

Table 5. Bivariate analysis of acute lower respiratory infection of under-five children in Yeka sub city, Addis Abeba, Ethiopia, 2017

Variables	COR (95% CI)	p-value	Variables	COR (95% CI)	p-value
Mother education*		0.03	**Child age(months)**		0.57
Illiterate	6.05(1-36.77)	0.05			
Read and write	0.43(0.1-3.5)	0.43	≤24 months	0.77(0.32-1.86)	0.57
Primary	0.3(0.1-1.1)	0.1	>24 months	1	1.00
Secondary	0.24(0.05-1.13)	0.1	**Child sex**		0.372
Preparatory	1.45(0.55-3.84)	0.55	Male	1.50(0.61-3.7)	0.372
Diploma and above	1	1.00	Female	1	1.00
Mother occupation		0.4	**Complementary feeding**		0.34
Laborer	0.1(0.004-1.82)	0.11	Before 4 months	2.67(0.72-9.89)	0.14
Private	0.04(0.002-0.82)	0.036	Between 4-6 months	1.21(0.15-9.70)	0.86
Government	0.042(0.002-0.80)	0.035	After 6 months	1	1.00
Business	0.040(0.001-1.219)	0.07	**Birth order**		0.12
Others	1	1.00	Below second child	0.38(0.11-1.29)	0.12
Father occupation		0.91	Second or above child	1	1.00
Laborer	3.46(0.37-32.25)	0.28	**Birth interval**		0.5

Private	1.73(0.2-15.0)	0.62	Less than one year	5.63(0.54-59.14)	0.15
Government	1.20(0.35-4.13)	0.77	between1-2 years	1.54(0.180-13.11)	0.7
Business	1.04(0.33-3.26)	0.95	Between 2-3 years	1.13(0.24-5.4)	0.88
Others	1	1.00	More than three year	1	1.00
House has window*		0.002			
Yes	0.09(0.00-0.70)	0.002	**Latrine type**		0.56
No	1	1.00	Water carriage	0.45(0.10-2.1)	0.30
Cooking material*		0.065	Ventilated improved	0.78(0.29-2.09)	0.61
Electric	0.32(0.12-0.87)	0.024	Traditional	1	1.00
Gas/kerosene	1.41(0.35-5.77)	0.63	**Household ciggarate smoking**		0.37
Charcoal/wood	0.78(0.09-6.6)	0.32	Yes	1.51(0.61-3.71)	0.37
Electric and charcoal	1	1.00	No	1	1.00
Crowding *		0.05			
<5	0.21(0.04-1.02)	0.05			
≥5	1	1.00			

*significant at p-value ≤0.10

4.5.1 **Multivariate analysis of acute lower respiratory infection of under-five children**

The multiple logistic regression analysis showed that there was statistically significant association between acute lower respiratory infection and maternal education, family size and presence of window. However, no statistically significant association was observed between cooking material and acute lower respiratory infection of under five children.

Table 6: Multivariate analysis of acute lower respiratory infection of under five children in Yeka sub city, Addis Abeba, Ethiopia, 2 017

Variable	ALRI		AOR (95% CI)	p-value
Mother education*				0.02
Illiterate	4	2	3.42 (0.41-28.26)	0.25
Read and write	28	1	0.16 (0.0-1.74)	0.13
Primary	123	3	0.19(0.05-0.75)	0.02
Secondary	99	2	0.18 (0.04 -0.87)	0.03
Diploma and above	133	11	1	1.00
House has window*				0.01
Yes	13	372	0.2(0.1-0.6)	0.002
No	8	54		1.00
Cooking material				0.13
Electric	9	302	0.32(0.11-0.9)	0.03
Gas/kerosene	3	23	1.1(0.22-5.64)	0.91
Charcoal/wood	1	14	0.69(0.05-10.53)	0.79

Electric and charcoal	8	87	1	1.00
Crowding*				0.04
<5	19	417	0.1(0.01-0.61)	0.01
≥5	2	9	1	1.00

*= significant at p-value<0.05

5. DISCUSSION

The overall prevalence of acute lower respiratory among under five children in Yeka sub city, Addis Abeba in the two weeks preceding the interview was 4.6%. This prevalence was comparable to cross sectional study done in Rwanda, which was 4% [7]. However, it was much lower than the finding of cross sectional study done in Brazil [21], which was 23.9%. This could be explained difference in the sample size and the setting where the research was done. ALRI among under two year in the retrospective study done in Nepal [44] is also much higher prevalent (52.0%) in relative to this study. The possible reason for this could be the methodology difference used in this study.

Another finding in this study was about one child of every sixteen children, 7.5%, children start complementary feeding before four months of age, the majority of study participants were first born child and of the 447 study participant 158(35.3%) cook family food at the living room and approximately quarter of participants has been living also in house made of mud wall and floor. More than half of the participants in this study used traditional latrine. This study also revealed that 18(8%) were delivered before two years of birth day celebration of their immediate older child and of the 447 child mothers nearly half had occupation of house wife.

Evidence from this study revealed that maternal education was significantly associated with ALRI. This was similar from the study done in Hatay city (33) where LRTI risk of children whose mothers took education less than 8 years was 2.07 times increased than educated for more than 8 years and in Brazil (21) where risk of acute lower respiratory illness was 65% greater for children of mothers with lower schooling as compared to children of mothers with ≥ 9 complete years. The possible reason for this could be educated mother had better health seeking behavior and indirectly the child will get better care.

The study indicated that children lived in household with window were significantly (AOR=0.2, 95% CI: 0.1-0.6, p-value=0.002) safe from being affected by ALRI. This finding is consistent with the findings from a case control study in Nepal (44).This could be due to the fact that presence of window increase the ventilation of house which indirectly avoid suffocation and risk of the respiratory infection with main mode of transmission is though air.

The study also showed that the number of children in the house hold with children less than five has reduced risk of ALRI (AOR=0.2, 95% CI: 0.03-0.93, p-value=0.04). This was similar with the studies done in Ethiopia, Este town [39], India [37] and meta-analysis of developing region [38]. This could be because of the reason that the lower the number of children in the house hold the lower risk of cross transmission of infection.

In this study there was no association between cooking material and ALRI, which was consistent with the study done in Rwanda [7], but it was different from the study done in Nepal [41]. This may be due to the fact that the cooking material used commonly is clean fuel (electric) which is one of transformation plan to increase access of electricity by Ethiopian government.

In this study the type of latrine were not associated with acute lower respiratory infection .This is inconsistent with the cross sectional study done in Rwanda(7), where a toilet type were associated with ALRI.The possible explanation for this could be accessibility improved latrine or utilization behavior of study participant .

There was also no significant association of ALRI with the maternal occupation. This finding was not supported by the study done in Ethiopia (35) that showed maternal occupation had a statistically significant association with ARI. This difference may be due to the difference in the definition of outcome variable.

In this study the occurrence ALRI was not affected by child breast feeding status. This is not in line with the study done in Netherlands (24) and Chile (25) where those breast-fed less than 4 months were at high risk to ALRI. The reason may be due to difference in the methodology used or various definitions of the breastfeeding categories. In this study there was also no difference in the occurrence of ALRI with the age of child. This is not consistent with findings done in Rwanda (7) and Butajira (26) where ALRI was particularly high among children less than two years and between 1-6 months respectively. This difference could be explained by the fact that difference in the methodology used and study setting. This finding also revealed that there was no a statistically significant difference in the occurrence of ALRI male and female child. This was different from the study done in Brazil (21) and Hatay city (33) where males were more likely to develop lower respiratory tract infections than females. The reason may be due to the fact that male children are required by parents and so the child will get better care by parents or the difference in setting can be possible reason.

The present study did not show any significant effect of exposure to cigarette smoking on children ALRI. This finding is not supported by the scientific articles published in in Hatay city (33) and US (44) where children exposing to second hand smoke had increased risks to ALRI .This could be because of the reason that the habit of cigarette smoking or place of cigarette smoking may be different.

6. STRENGTH AND LIMITATION OF THE STUDY

Strength of the study: As it was done in the majority of Woreda it may reflect the actual prevalence of the sub city. As far as possible the study had used latest literature and response rate was hundred percent. In testing associations for significance, confounders (age, sex) were controlled using logistic regression (it is known that multivariate logistic regression control the confounder automatically).

Limitation of the study: Information on was based on mothers reporting about the ALRI status of children and no clinical examination were undertaken, which may have caused misclassification bias. Since the study also was cross-sectional in design, it may not be strong enough to demonstrate direct cause-and-effect relationships between risk factors and ALRI.

7. CONCLUSION AND RECOMMENDATION

The prevalence of acute lower respiratory infection was low. This study has demonstrated that the preventive factors for acute lower respiratory infection were maternal education to primary or secondary level, household with window and less than five children in the household. These risk factors can be modified:

- The Woreda Health Office, in collaboration Woreda education office should increase and promote female education to primary level and secondary level.
- The Woreda Health Office, in collaboration with health professionals should encourage community to build house that have window.
- The Woreda Health Office, in collaboration with health professionals should increase community awareness on the benefit of family planning method (both short and long term method) for child spacing so as to reduce crowding in the house hold.
- Furthermore, researchers should conduct analytical observational studies to investigate the relationship between acute lower respiratory infection and different determinants of it in the same study setting.

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9. ANNEXES AND QUETIONAIRE

Information sheet for child parent

I am master of public health student at Addis Abeba University. I would like to spend thirty minutes to ask you about prevalence and risks of acute lower respiratory infection among under five children. Your information will help to improve the health of your child and for other children in Yeka sub city. Whatever information you provide will be kept strictly confidential, and will not be shown to any other person or used for any other purpose other than for analysis. You will not get any incentive that you are participating in the study rather it is full of voluntary and You don't have to answer any question that you do not to answer, and you may end this questionnaire any time you want to. However, your honest responses to these questions will help us better understand risks of acute respiratory infection. Do you have any questions? If you want to know more information, you can contact the principal investigator by the following address below.

Bashaw Wogderes (BSc)

Cell phone: +251-09 20 31 90 98

E-mail: bashaw.w2000@gmail.com

May I interview you questions that relates to the study?

Yes

No

1. Annex one structured questionnaire English version

Instruction: Ask the following questions then circle their answer on the options column if it is a choice question or write their answer on the blank space if it is an open ended question.

PART ONE:-ENTRANCE QUESTIONS

No	Questions	Response and code	Skip
101	Do you have under five child in your home?	Yes---------1 No----------2	If 'Yes' skip to Q102 / if 'No' stop interview
102	Did your child had the following symptoms in last two week? □ Cough and/ or □ fever	Yes---------1 No----------2	If 'Yes' skip to Q103 / if 'No' skip to Q104
103	ASK/Check the child for the following sign? □ short ,rapid breathing □ or breathlessness □ or wheezing □ and chest retractions	Yes---------1 No----------2	
104	Code of woreda/ Ketena		

Part II FAMILY SOCIOECONOMIC STATUS

No	Questions	Response and code	Skip
201	What is Family Religion?	Orthodox Christian---1 Muslim----------2 Protestant----------3 Catholic----------4 Other----------99	
202	What is Educational status of mother?	Illiterate----------0 Read and write--------1 Primary----------2 Secondary----------3 Preparatory----------4 Diploma and above----5	
203	What is Educational status of father?	Illiterate----------0 Read and write--------1 Primary----------2 Secondary----------3 Preparatory----------4 Diploma and above----5	
204	For mother, What is your usual work?	Laborer----------1 Private service----------2 Govt. service----------3 Business----------4	

		Others ----------99	
205	For father, What is your usual work?	Laborer----------1 Private service----------2 Govt. service----------3 Business----------4 Others ----------99	

Part III HOUSE HOLD LEVEL FACTOR

No	Questions	Response and code	Skip
301	How many children do you have?		
302	Do your living room have windows?	Yes----------1 No----------2	
303	What type cooking of material do you used?	Electricity or ----------1 gas or Kerosene ----------2 Charcoal ,Wood/ ----------3 Animal dung----------4 Charcoal and electricity---------5 Others----------99	
304	Where do you cook family food?	Separate building----------1 Separate room----------2 Living room----------3	

		Others----------99	
305	What is family Source of drinking water?	Pipe water----------1 Protected dug well----------2 Unprotected dug well----------3 Others----------99	
306	What Type of toilet facility do family used?	Water carriage latrine ----------1 Ventilated improved pit latrine--2 Traditional latrine----------3 Others----------99	
307	Is there any who smoke cigarettes at home?	Yes----------1 No----------2	

Part IV: CHILD RELATED FACTOR

No	Questions	Response and code	Skip
401	How old he/she is (Age in months)?		
402	What is Sex of child?	M----------1 F----------2	
403	Has he/she been taking to day care centre?	Yes----------1 No----------2	
404	What is the Immunization status of your child?	Not started----------1 Up to date----------2 Loss to follow up----3	

		Completed----------4	
405	Did you give your child other food in addition to breast milk before age of 6m celebration?	Yes----------1 No----------2	If 'Yes' skip to Q 406 / if 'No' skip to Q407
406	When did you start?	before 4months------1 between 4-6month--2 at 6months----------3	
407	How many children had been born before this child was born?		
408	After how many years child was born in relative to her/his older brother/sister?	Less than a year----------1 From a year- two year----------2 From two year -three year------3 three year and above----------4	

PART V:-ASSESS NUTRITIONAL STATUS

501. Measure MUAC for child greater or equal to six months_____

Annex 2: Structured Questionnaire Amharic Version

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