TREND OF BURDEN OF INFLUENZA ASSOCIATED SARI AND FACTORS ASSOCIATED WITH SARI IN KIBONDO DISTRICT, KIGOMA REGION, TANZANIA

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Department of Epidemiology and Biostatistics

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By

John Nsomi Sagaika

A Dissertation/Thesis Submitted in (partial) Fulfillment of the Requirements for the Degree of Master of Science (Applied Epidemiology) of

Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences of thesis/dissertation entitled "***Trend of burden of influenza associated SARI and factors associated with SARI in Kibondo district, Kigoma region, Tanzania***" in (partial) fulfillment of the requirement for the degree of Masters of Science (Applied Epidemiology) of Muhimbili University of Health and Allied Sciences

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DECLARATION AND COPYRIGHT

I, **Sagaika,** John declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for similar or any other degree award.

Signature …… **Date** ……..

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DEDICATION

I would like to thank our almighty God who gave me strength and knowledge in my everyday life, and made it possible to accomplish this work. I dedicate this dissertation to my loving wife Ms Happy Amos and my daughters Loveness and Liviah, for their understanding and for their overwhelming patience during this period, my eternal gratitude. Also I dedicate this work to my parents, Mr. and Mrs. Nsomi Sagaika Sono for their moral support and prayers. I extend my dedication to my brother Emmanuel N. Sagaika and sister Elizabeth N. Sagaika for their eternal love. And finally I dedicated this work to my late grandmother, Masalu Madilo who inspired me to be strong despite of many obstacles in life.

ABSTRACT

Background: Data on the burden of influenza in developing countries are limited. Despite the availability of influenza surveillance system in Tanzania, there is scarcity of information on the burden of influenza and its associated factors within the country. Thus this report present the results from a study aimed to assess the trend of influenza associated with severe acute respiratory infections (SARI) and their associated factors.

Methods: We conducted a study with two components, a retrospective longitudinal study component and an unmatched hospital based case-control component in Kibondo district. The retrospective cohort study was conducted to determine the trend of influenza associated severe acute respiratory infection (SARI) using data the SARI patients records admitted during 2013 to 2015 registered in the influenza surveillance registers, data base of laboratory results for influenza among SARI from the Ministry of Health and other relevant hospital records. We used WHO manual for estimation and calculation of burden of influenza, data was collected by using formatted checklists. An unmatched hospital based case- control component was then conducted during March and April 2017 to determine factors associated with severe acute respiratory infections. Data were collected using a structured and pretested questionnaire among cases and controls at a ratio of 1:2. Data were analyzed by using Epi info version 3.5.1 and Stata software for descriptive statistics and unconditioned logistic regression at $p < 0.05$. Graphical work was done using Ms excel.

Results: During 2013-2015, a total of 2705 SARI cases across all age groups were admitted at Kibondo sentinel hospital, out of those 2515(92.9%) cases were residents of Kibondo District council. A total of 1002 (39.8%) cases from whom clinical specimens were taken and180 (17.9%) were positive for influenza. Most of cases were children < 5 years (65.2%). The median age was 2 years, range (0.08 -90) years. The overall estimated incidence of influenza associated SARI during 2013-2015 was 317(95%CI: 274-368) per 100,000 persons-years. The estimated annual incidence of influenza associated SARI in 2013, 2014 and 2015, was 80 (95%CI: 62-104), 155(95% CI: 128-190) and 52 (95%CI: 33-82) per 100,000 persons-years respectively. The estimated incidence of influenza associated SARI in children < 5 years old was 277(95%CI 313-360); 574 (95%CI 479-689) and 136(95%CI 85-218) per 100,000 persons-years, during 2013, 2014 and 2015

respectively. The incidence of influenza associated SARI in people aged ≥ 5 years was 24(95%CI 14-44); 41(95%CI 25-70) and 24 (95%CI 8-75) per 100,000 person-years during 2013, 2014 and 2015 respectively. The annual hospital case fatality ratio in 2013, 2014, and 2015 was 0.9%, 1.6% and 2.9% respectively. There were higher hospital case fatality ratio among persons with age group of ≥ 5 years in 2013 and 2014 which was 4.2% and 2.9% respectively compared to children < 5years which was 2.1 and 1.1, respectively. The annual hospital case fatality ratio among < 5 years increased in 2015 which was 1.4 for < 5 years compared to ≥ 5 years which was zero. Annual influenza positivity among SARI cases in 2013, 2014 and 2015 were 8.8%, 47.4% and 17.4% respectively.

Factors associated with severe acute respiratory infections (SARI) were passive smoking [OR 25.05(95%CI: 7.48-96.02)], indoor air pollution [OR 2.61 (95%CI: 1.10-6.19)] and contact with person with respiratory infections in the past seven days [OR 73.00 (95%CI: 18.82-283.16)]. Persons at the age group of < 5years were at higher risk for SARI compared to those at the age group of (25-44) [OR 18.93 (95%CI: 4.66-76.86)], also persons at the age group of ≥ 45 years were at higher risk for SARI compared to those at the age group of (25-44) [OR 5.46 (95%CI: 1.06-28.13)] respectively.

Conclusions: We found substantive influenza burden leading to hospitalization and mortality in Kibondo district. Children aged < 5 years were hospitalized for influenza at higher rates than people aged ≥ 5 years. The hospital case fatality ratio was higher among persons ≥ 5 years compared to children < 5 years. Factors associated with SARI include; indoor air pollution, passive smoking, contacts a person with history of respiratory infections and age. The findings highlight the need for a wider study to explore the burden of influenza and reviews of SARI case management practices to provide adequate data for planning national wide management and preventive programmes. Furthermore, future studies should examine other causes of SARI apart from influenza virus and burden of influenza into key potential risk groups.

LIST OF ABBREVIATIONS

ARI	Acute Respiratory Infection
ALRI	Acute Lower Respiratory Infections
CFP	Case Fatality Proportion
DHIS2	District Health Information System
HAS	Hospital Admission Survey
HIV/AIDS	Human Immune Virus/ Acquired Immune Disease Syndrome
ICU	Intensive Care Unity
IHR	International Health Regulation
ILI	Influenza like Illness
MOHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MUHAS	Muhimbili University of Health and Allied Health Sciences
NHL-QATC	National Health Laboratory, Quality Assurance and Training centre
OPD	Out Patient Department
SARI	Severe Acute Respiratory Infection
TFELTP	Tanzania Field Epidemiology and Laboratory and Training Program
WHO	World Health Organization
CFR	Case Fatality Ratio

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DEFINITION OF TERMS

Study area is an area at which the study is to be conducted

Study period is a period during which data were collected used for the study (2013-2015)

Catchment area is the area around which the populations living within seek medical services to a specific health facility located in that area

Population at risk is the population under surveillance

Hospital admission survey (HAS) is the method used to estimate the denominator population (population at risk) when estimating incidences if it happens that pneumonia cases are visiting more than one health facility (i.e. apart from the sentinel site where your study is being conducted)

SARI an acute respiratory infection with a history of fever or measured fever of ≥38 ˚C; and cough; with onset within the last 10 days; and require hospitalization.

Passive smoking was defined as presence of an active smoker at household

Indoor air pollution was defined as exposure to air pollution producing during food cooking, when cooking taking place inside a living house.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Influenza virus is a leading cause for acute respiratory infections (ARI). In 2008, it was estimated that 28,000-111500 deaths occurred in under five years children that was attributable to influenza associated acute lower respiratory infections (ALRI) with 99% of these deaths occurring in developing countries (1). The annual attack rate of seasonal influenza estimated to vary from 5% to10% in adults and 20% to30% in children leading to significant level of illness, hospitalization and deaths worldwide. Annual epidemics have been estimated to result in about 3 to 5 million cases of severe illness and approximately 1million deaths (2).

Influenza virus infections are easily transmitted from person to person causing both seasonal and pandemic influenza infections which usually occur during favorable seasons. The factors associated with the burden of influenza and severe acute respiratory infections includes individual factors (underlying medical conditions i.e. heart disease, pregnancy, diabetes, HIV/AIDS), social factors (overcrowding, and smoking), institutional factors (capacity of healthcare providers and availability of drugs) and social demographic factors: age, sex, education and occupation (2,3).

Control and prevention of seasonal and pandemic influenza infections require effective interventions as it has been shown in a number of studies across countries, these include availability of appropriate policies (4), non pharmaceutical interventions which include use of protective gears and effective hand hygiene (5). Annual influenza vaccination has been the key effective prevention strategy for influenza infections prevention (2).

The World Health Organization response include encouraging and supporting its regional member countries to adopt strategies to monitor influenza activities through surveillance of influenza like illness (ILI) and severe acute respiratory infection (SARI) using influenza sentinel surveillance system. The influenza sentinel surveillance system aims at describing trends of influenza over time, enable national health authorities interpret their surveillance data in an international context and plan intervention strategies.

In compliance to the global developments, in 2008 Tanzania established a sentinel influenza surveillance system involving 6 hospitals which includes, Kibondo District Hospital in Kigoma, Sekuo Toure Regional Hospital in Mwanza, and Dodoma regional Hospital in Dodoma, Haydom Lutheran Hospital in Manyara, and Mwananyamala Municipal Hospital and International School of Tanzania Clinics in Dar es Salaam (Figure 1).

A report published after 30 months of implementation for influenza sentinel surveillance system observed that among others, young children were at higher risk and called for more efforts to understand better burden of influenza among elderly individuals in our setup (6). Consequently, this study aimed to generate information on the medical burden of influenza that will contribute to better understanding of morbidity and mortality due to influenza among severe acute respiratory infections (SARI) in one of the sentinel surveillance sites, Kibondo in Kigoma region.

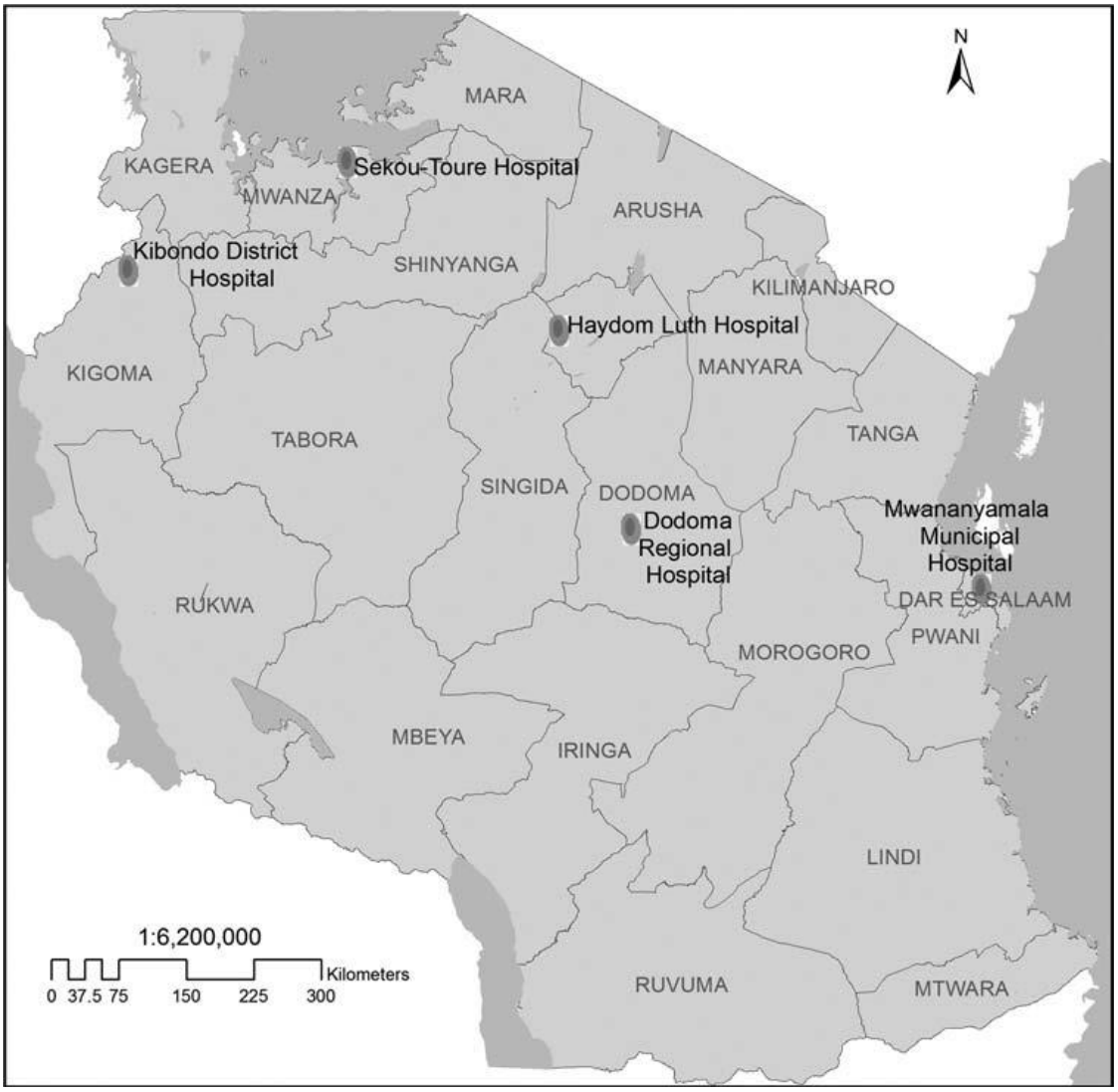


Figure 1: The national influenza sentinel sites- Tanzania

1.2 Problem statement

Influenza causes significance burden of respiratory infections leading to hospitalization among young children worldwide, as it contribute 10% of respiratory hospitalization in children under 18 years (7). In Tanzania, the HMIS report revealed that acute respiratory infections contributed 11.3% and 13.5% of hospital admission in 2012 and 2013 respectively among < 5 years and 11.3% and 6% respectively among persons aged five years and above.

The National influenza sentinel surveillance system was established in 2008 with the aim of better understanding the epidemiology of influenza and its seasonality in Tanzania. Preliminary report of influenza positivity among SARI case has demonstrated that influenza positivity among SARI cases was 7.3% (6). Furthermore, this study did not assess the trend of burden of influenza as well as factors associated with severe acute respiratory infections. That notwithstanding neighboring countries implementing influenza surveillance sites have reported substantive burden of influenza, with high case fatality rates. Additionally the reports demonstrated factors associated with SARI including indoor air pollution, passive smoking as well as social demographic factors (8).

However, there is limited information on the incidence of influenza associated SARI, hospital case fatality ratio, and risk factors associated with SARI in Tanzania which can be useful for local public health practitioners for planning effective prevention programs.

Therefore, this study aimed at applying mixture methodology to determine the burden of influenza associated SARI and factors associated with SARI using WHO Influenza manual

1.3 Rationale of the study

Influenza disease burden data are inadequate in developing countries (9). Local data on influenza disease incidence and case counts are useful for decision makers in these countries to assess the public health importance of influenza, to identify high risk groups, to allocate resources efficiently, and to consider the cost-effectiveness of preventive strategies, such as vaccination. In Tanzania, data from National Health Information Management System show that acute respiratory infections and pneumonia are still leading cause of hospitalization both in young children and adults, despite the fact that in children, haemophilus influenza vaccine has been initiated since 2009. Introduction of influenza vaccination program has shown to lower the incidence of influenza and severe acute respiratory infection hospitalization as noted in Mauritius, Egypt, Ivory Cost, and Morocco (10). Determining the amount of influenza-associated severe disease will likely have greater public health significance as the findings will be used for:

1. Planning of health education interventions to prevent the population from risk factors associate with influenza and severe acute respiratory infections.
2. Further research, as a baseline data for further research and new events determination i.e. outbreak
3. For responsible authority and non-government agencies will provide evidence based decisions for effective allocation of resources in heath interventions and researches.
4. At the National level, planning of effective heath intervention for influenza including development of national policy for influenza vaccination use and adequate supply of antiviral drugs for treatment of influenza and severe acute respiratory infection.

1.4 Research questions

1. What is the trend of the burden of influenza associated SARI in Kibondo?
2. What are the risk factors associated with severe acute respiratory infections (SARI)?

1.5 Objectives

1.5.1 General objective

Estimation of burden of influenza associate SARI and its associated factors in Kibondo district from 2013 to 2015, during March to April 2017

1.5.2 Specific Objectives

i. To determine the trend of annual incidence rate of influenza-associated SARI in Kibondo district from 2013 to 2015, during March to April 2017
ii. To determine the trend of annual hospital case fatality ratio of SARI in Kibondo district from 2013 to 2015, during March to April 2017
iii. To determine the trend of annual percentage positivity for influenza virus among SARI cases in Kibondo district from 2013 to 2015, during March to April 2017
iv. To determine the risk factors associated with severe acute respiratory infections (SARI) in Kibondo district during March to April 2017

1.6 Conceptual framework

Influenza viruses have been reported as the leading cause of severe acute respiratory infections leading to hospitalization and mortality but not all severe acute respiratory infections are associated with influenza virus. Surveillance of influenza through SARI, target to monitor trend of influenza as well as to provide information for prevention programs i.e. Vaccination. Severe acute respiratory infections (SARI) follows the epidemiological triangle model which explains the mechanism for infection and spread of infectious diseases as consisting of infectious agent, a susceptible host and favorable condition (environment): Age and sex, influenza infection differ with age group, children and adults are at high risk due to low immunity. For sex, infections differ due to different

on inflammatory immune response between female and men. Overcrowding favor influenza transmission as predispose to a great risk of exposure. Smoking increase risk for influenza infection through depressant effect on the immune effect, also increase viral load or duration of viral shedding. Underlying health conditions increase the risk of influenza infection through depressant effect on the immune leading to increased fatal outcome and hospitalization .Influenza transmission influences by air temperature and humidity leading to seasonality in temperate climate. This study was not included health system factors.

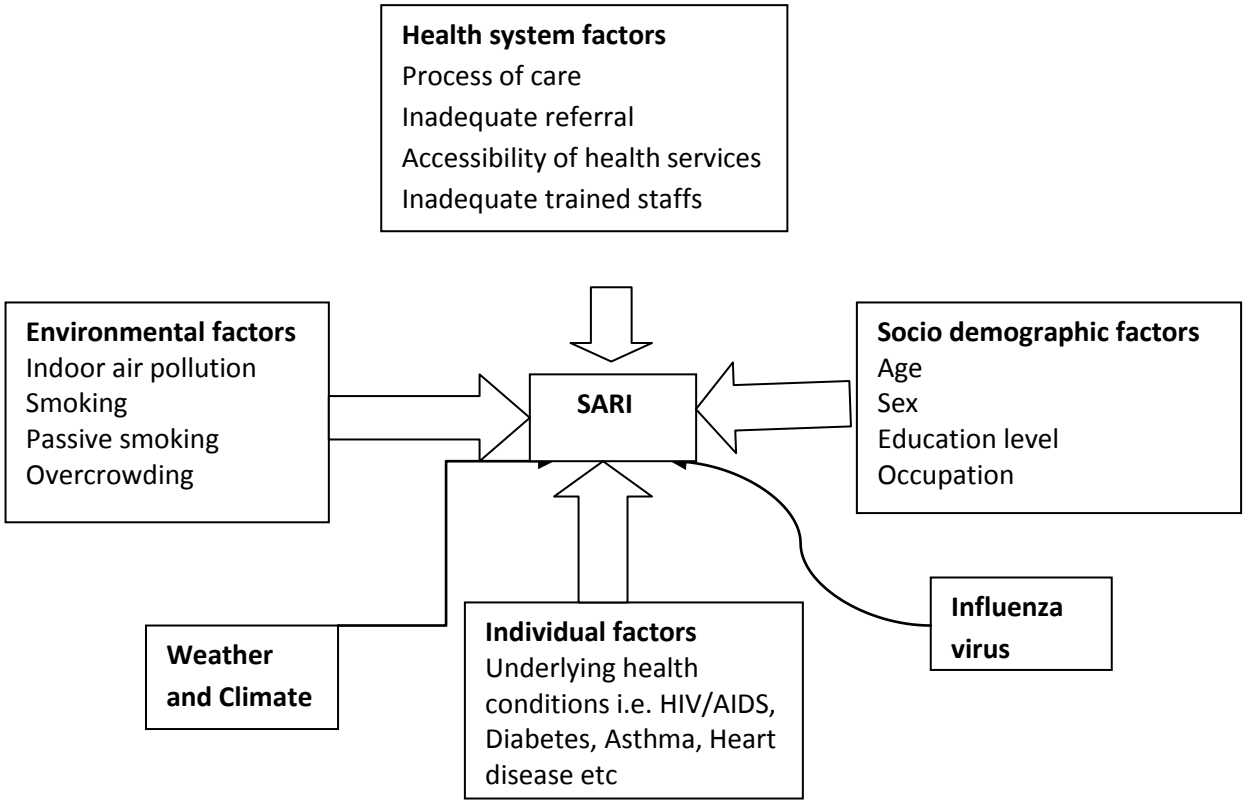


Figure 2: Conceptual framework

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Incidence of influenza associated SARI

Seasonal influenza affects all age groups with an attack rate varying from 5 to 10 % in adults and 20 to 30 % in children leading to 3-5 millions severe disease and about 1 million deaths worldwide (2). Among low income countries it has been revealed that influenza virus contribute 8 to 40% of influenza like illness (ILI) and 5 to 27 % of severe acute respiratory infections (SARI) (11). In Bangladesh, estimate of incidence rate of both ILI and SARI influenza associated using surveillance data which revealed that incidence of influenza associated SARI in children < 5 years was 6.7 and 6.5 per 1000 person–years during the 2008, 2009 and 2010 influenza seasons, respectively (12). Thus there is a variation of burden of influenza by age and also by time. A study done in Oman revealed that from January 2008 to June 2013, influenza virus strains were detected in 8% of cases for whom samples were available and annual incidence rates ranged from 0.5 to 15.4 cases of influenza-associated SARI per 100,000 populations (13). The study done in Kenya for estimation incidence of influenza associated SARI revealed that the annual number of hospitalized influenza-associated SARI cases ranged from 17,129–27,659 for children <5 years old with the incidence of (2.9–4.7 per 1,000 persons) and 6,882–7,836 for persons ≥5 years old with the incidence (0.21–0.24 per 1,000 persons) (14).

2.2 Hospital case fatality ratio for severe acute respiratory infection (SARI)

The data for annual number of hospital admissions and in-hospital deaths due to severe acute respiratory infections (SARI) are significant for improving health care services. Globally, the hospital case fatality ratio estimates for severe acute respiratory infection was 2.3% (1.6%-3.4%) in developing countries and 0.6% (0.4%-0.8%) in developed countries (1). In Kenya, surveillance report revealed that, the hospital case fatality ratio was 2.7%, (out of 9,419 SARI cases admitted in sentinel hospitals 2.7% died) (15). Another finding in South Africa revealed that out of 1358 SARI cases admitted in sentinel hospitals 3% died; therefore the hospital case fatality ratio was 3%, (16). Further study on the case fatality ratio in Egypt revealed that the hospital case fatality ratio among children hospitalized with

severe acute respiratory infection (SARI) was 5.5% (17).Thus understanding the hospital case fatality ratio for severe acute respiratory infections is vital in order to assist decision makers for resources allocation to improve health care services.

2.3 Percentage positivity of influenza among SARI cases

Surveillance of influenza like illness (ILI) and severe acute respiratory infection (SARI) aims to determine the trend of influenza across the world. The previous report of influenza surveillance in European regions revealed that 27% of SARI cases were tested positive for influenza (18) **.** Another study has revealed that influenza virus contribute 5 to 27 % of severe acute respiratory infections (SARI) in low income countries (11). In North Africa it has been reported that 27% of SARI cases were positive for influenza (19). In West Africa influenza positivity among SARI cases was 5% (20). Further surveillance report in East Africa revealed that in Democratic Republic of Congo, 16% of SARI cases were positive for influenza (21). In Tanzania the previous surveillance report revealed that, the percentage influenza positivity among SARI cases was 7.3% (6). Thus it's important to understand the trend of influenza positivity among SARI cases for planning effective public health interventions.

2.4 Factors associated with incidence of influenza and mortality among SARI

Several factors have been documented to be associated with influenza virus infections leading to severe outcome; these factors such as social demographic factors, underlying medical conditions and social factors has been reported to vary with place and time (22).

2.4.1 Age

Studies have shown that age was associated with influenza incidence and mortality. People of higher ages such as 65 years and above was reported to be at higher risk for mortality from influenza infections. A study done in the United State of America (USA) revealed that mortality due to influenza was highest among people of 75 year old and above compared to those whose age was 18 years or lower (23). Similar relationship was revealed in Brazil and South Africa where also case fatality rate increased with increasing age respectively (16,24). A study done in China revealed that under five years children and

age group of 5- 15 years were having highest attack rate of influenza compared to other age groups (3). Similar result observed in Australia, Kenya and Guatemala that under five years children were under higher risk of influenza compared with other age group (14).

2.4.2 Sex

It has been observed that influenza incidence and mortality were associated with sex. Findings from different studies observed that there is difference in incidence, severity and case fatality rate between male and female which vary between countries (23). In China post pandemic influenza outbreak report of 2009, revealed that males were found to be at higher risk of influenza compared to women (25). Studies in other countries found that there were no male- female difference in the risk of influenza (26,27). However other countries reported that majority of critically ill patients were women (female of reproductive age 15-49 years) compared to men, this was observed in USA and Canada(28,29), this is similar to findings that were reported in Mexico, Australia and New Zealand (30). However it can be agreed that outcome of influenza disease differs between male and female given existing contexts.

2.4.3 Underlying chronic medical conditions

Review of literature has revealed that influenza and severe acute respiratory infections are associated with chronic medical conditions in affected individuals. Pregnancy, diabetes, chronic liver disease, chronic kidney disease, COPD and HIV are chronic conditions that have been documented in some studies to be associated with influenza attack rate and case fatality rate among influenza patients. A study done in Oman revealed that majority of influenza cases had chronic medical conditions compared to non-influenza SARI cases (13) . Relationship between existing chronic conditions and influenza infections and mortality among patients with severe acute respiratory infection has also been supported by other studies (19,31) .

2.4.4 Smoking

Exposure to smoking either by use of smoke producing cooking fuels in households or passive smoking has been associated with high prevalence of severe acute respiratory

infections (32). The finding are similar to other studies which have revealed that smoking contributed to the burden of severe acute respiratory infections (33).

2.4.5 Overcrowding

Overcrowding has been associated with severe acute respiratory infections. It was observed that family size of more than 5 siblings compared to those with fewer had significantly higher prevalence of severe acute respiratory infections (32), similar report was revealed in Greenland and Kenya (34,35).

2.4.6 Weather and influenza

Literature has reported influenza to be associated with weather and climate, a retrospective study done in U.S.A, showed an association between year to year humidity and the timing of seasonal influenza onset, in temperate climates (36). This differ in tropical climate/locations which generally lack a seasonal influenza peak as tropical climate are dominated by direct contact transmission which are not influenced by air temperature and humidity (37). However several reviews on climate and influenza seasonality revealed that no firm conclusion on the causes of influenza seasonality, but suggested that causes are complex and multifactorial which require interdisciplinary cooperation (38,39)

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

The study was done at Kibondo district hospital located in Kibondo district, Kigoma region. Kibondo sentinel site was selected because there were no multiple facilities likely to admit SARI patients within the study area; therefore it was easier to define the catchment population which was used as a denominator for estimation of influenza incidence rate among SARI cases. Furthermore surveillance has been conducted throughout the years of study (from 2013 to 2015) and presence of proportion of SARI cases that tested positive for influenza.

Kibondo district hospital is located in Kibondo district which has an area of 8,364.84 square Km and it is bordering with Kakonko district on north, Bukombe district on east, Urambo district on south east, Kasulu and Kigoma districts on the south west and Republic of Burundi on the west, with a population of 261331 with an average of 5 persons per household. Kibondo has a tropical climate with an average annual temperature of 19.6 ^{o}C and annual rainfall 1196 mm.

3.2 Components of the study

The study has two components to address its objectives and includes; the first component was retrospective longitudinal study aimed at determining the trend of burden of influenza associated SARI from 2013-2015. The second components aimed on to determine the factors associated with SARI using unmatched case control.

3.2.1 Retrospective Longitudinal study

This was the first component of the study which estimated the annual incidence rate of influenza associated SARI, annual hospital case fatality ratio among SARI cases and annual percentage positivity for SARI. The component applied the WHO manual for estimation of burden of influenza in areas doing sentinel surveillance (22), (Study period 2013-2015).

3.2.1.1 Study population

Study population was all cases of SARI registered in the inpatient registers and influenza surveillance registers for the period, from January 2013 through December 2015 at Kibondo hospital. It entailed the collection of information on all SARI cases admitted at the sentinel site from 2013-2015. Cases were the patients admitted at the sentinel hospital due to acute respiratory infection diagnosis, with fever and cough for the study period (2013-2015)

3.2.1.2 Inclusion and exclusion criteria

3.2.1.2.1 Inclusion criteria

All severe acute respiratory infection cases admitted at the sentinel hospital from 2013 to 2015.

3.2.1.2.2 Exclusion criteria

All severe acute respiratory infection cases admitted at the sentinel hospital from 2013 to 2015, but their area of residence was not recorded.

3.2.1.3 Sample size

The study used the annual general population in the study area to estimate the population at risk (catchment population of the sentinel hospital) as a denominator for estimation of annual incidence rate of influenza associated SARI. The district has a population of 261,331 from the previous census report of 2012 (Projected annual population was used). All patients admitted at the sentinel site with severe acute respiratory infections during the study period (from January 2013 through December 2015) were included in the study.

3.2.1.4 Sampling technique

Purposive sampling was used for this study, all SARI cases admitted at the sentinel hospital from 2013 to 2015.

3.2.1.5 Variables

3.2.1.5.1 Dependent variable

The study has two outcome variables, influenza used for estimation of influenza incidence rate among SARI cases and mortality among SARI cases used for calculation of hospital case fatality rate.

3.2.1.5.2 Independent/Explanatory variables

The explanatory factors that were included during data collection were socio demographic factors which include age, sex, date of admission, admission diagnosis, outcome and locality.

3.2.1.6 Data collection instruments

A format (checklist) was prepared to facilitate the extraction of information on SARI cases from the registers and records. The checklists collected information on age, sex, symptoms and place of residence. Others were outcome, specimen taken and laboratory results. The team retrieved all admission registers and relevant records used during the study period. Verification process was done to make sure that all registers and records were available. The records involved at the sentinel hospital include hospital admission registers (MUTUHA 14), SARI data base at the hospital and DHIS2. Laboratory results for the SARI cases tested were obtained from the MOHCDGEC data base at the surveillance section.

3.2.1.7 Data collection technique

Data collection technique used was review of existing records and compilation using pre tested format (checklist). The data for each case were then filled in the pre prepared format.

3.2.1.8 Pretesting of tools

Pretesting of data collection tools (checklist) was done at Maweni regional hospital, in Kigoma region

3.2.1.9 Recruitment and training of research assistants

The study recruited and trained three research assistants for data collection. Three enrolled nurses were recruited as research assistants among health personnel’s working at Kibondo

district hospital and trained on the procedures of data collection and confidentiality of the collected data. One of them was among of influenza surveillance staffs at Kibondo sentinel hospital.

3.2.1.10 Data collection

Data were collected by research assistants and the principal investigator within the period of two months, from March 2017 to April 2017 by using the English version checklist. The team retrieved all admission registers and relevant admission records used during the study period, verification process was done to make sure that all registers and records were available. The records involved hospital admission registers (MTUHA NO.14), SARI data base at the hospital and DHIS2 were used as the data sources. Laboratory data from the MOHCDGEC data base for laboratory results among SARI cases. Desk review of patient registers and records was done to determine the number SARI cases admitted at the sentinel hospital from 2013 to 2015. Then information for each case observed was filled in the pre-tested checklist.

3.2.1.11 Data quality

The principal investigator was responsible for data retrieval and supervising the whole process of data extraction from the patient registers and other relevant records. Checklists were reviewed for consistence and completeness of the variables extracted from the patient's records, those with unclear or missing information were identified, traced and rectified. Data were then entered in MS excel data bases. Data cleaning were done before data analysis by using Epi info version 3.5.1 and MS excel.

3.2.1.12 Data management and analysis

The collected data were checked for relevance and completeness still ensuring inclusion of Kibondo district residents only for estimation of incidence of influenza associated SARI. For calculation of hospital case fatality rate all cases were used regardless of locality. The collected data were then entered into computer and data analysis was done both by MS excel and scientific calculator.

The estimation of incidence rate of influenza associated SARI and calculation of hospital case fatality rate for retrospective cohort study followed the WHO manual for Estimating Disease Burden associated with Seasonal Influenza (22):

i. The total number of SARI cases admitted at the sentinel facility each year from 2013 to 2015.

ii. Proportion of SARI cases from which specimen was taken each year from 2013 to 2015.

iii. The total number of SARI cases which tested positive for influenza each year from 2013 to 2015.

iv. The number of SARI deaths occurred at the sentinel facility each year from 2013 to 2015.

v. Estimated number of influenza associated SARI = number of influenza positive SARI ÷ proportion of SARI cases from which sample were taken for influenza testing

vi. Proportion of pneumonia cases admitted at the sentinel facility that will be used to estimate the population at risk, this will be obtained by conducting hospital admission survey among all facilities which are likely to admit pneumonia cases located in the study area. [Population at risk = proportion pneumonia at the sentinel × total population in the study area (Projected annual population was used from the national census of 2012)].

vii. We used DHS2 data source to get the proportion of pneumonia cases which were recorded using ICD 10.

viii. Incidence rate of influenza associated SARI = the number of estimated influenza associated SARI ÷ Population at risk, and will be expressed as per 100,000population.

(**Numerator** = estimated number of influenza associated SARI cases and

Denominator = estimated population at risk (population under surveillance)).

ix. For calculation of 95% CI, the calculated incidence rate will be divided by the error factor to get the lower limit, and the upper limit by multiplying the incidence rate by error factor. [EF = $e^{1.96/\sqrt{d}}$, where d = number of influenza positive among SARI cases] (22).

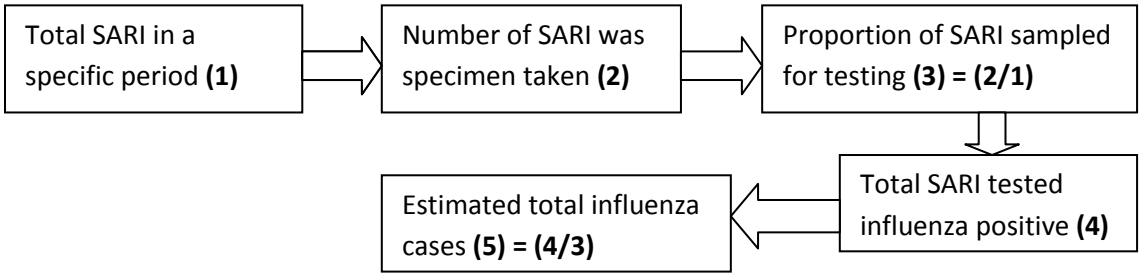
x. Hospital case fatality rate = [total SARI deaths occurred ÷ total SARI cases admission] × 100%.

(**Numerator** = number of deaths among SARI cases admitted each year, and

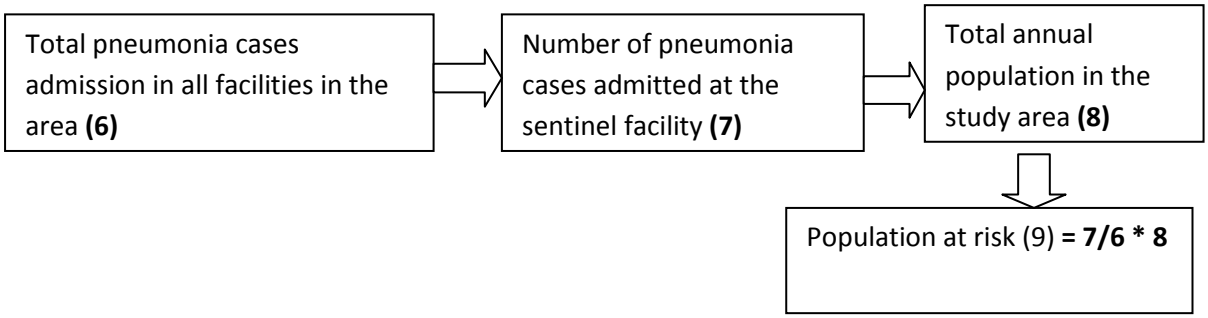
Denominator = total number of SARI cases admitted at the sentinel facility each year)

Steps for estimation of incidence rate at area with SARI surveillance (WHO MANUAL 2015)

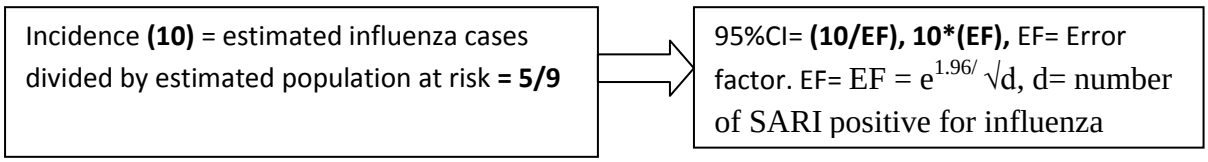
1st step estimation of the number of influenza cases



2nd step estimation of the population at risk using (HAS)



3rd step calculation of incidence rate and its 95% CI, estimated per 100,000 person-year



3.2.2 Unmatched case control study

This was the second component of the study conducted to determine the risk factors associated with severe acute respiratory infections (SARI). Unmatched case control study design was used because we wanted to assess the effect of all variables including age and sex on the occurrence of the disease. Consequently the controls were randomly selected from none ARI cases admitted in the same facility in the ratio of one case to two controls each day.

3.2.2.1 Study population

The study collected data from SARI cases and Controls admitted at the sentinel hospital during data collection period (March to April 2017).

1. **Cases** were classified as SARI cases admitted at sentinel hospital during data collection period. SARI was defined as any acute respiratory infection with: a history of fever or measured fever of ≥ 38 ˚C; and cough; with onset within the last 10dys; and require hospitalization.
2. **Controls** were classified as patients admitted at the sentinel hospital with non-respiratory medical conditions.

3.2.2.2 Inclusion and exclusion criteria

3.2.2.2.1 Inclusion criteria

SARI cases that were admitted at the sentinel hospital during data collection period, from March to April 2017

3.2.2.2.2 Exclusion criteria

SARI cases that were admitted at the sentinel facility during data collection from March to April 2017, but rejected to participate in the study or due to other factors such as admitted very sick, mentally handicapped, were not included in the study

3.2.2.3 Sample size

1. **Cases**, all cases of severe acute respiratory infection (SARI) that were admitted at the sentinel facility during data collection period (March to April 2017) and consented to participate in the study. A total of 109 SARI cases were enrolled in the study

2. **Controls**, the number of controls was determined by the number of SARI cases that were detected during data collection period, as patient with non-respiratory medical conditions admitted at the sentinel hospital and was obtained at a ratio of 2controls: 1case, matched by date of admission. A total of 218 controls were enrolled in the study

3.2.2.4 Sampling technique

1. **Cases**, SARI cases were patients with an acute respiratory infection with a history of fever or measured fever of ≥ 30˚C; and cough; with onset within the last 10 days and required hospitalization. We identified cases from the admission register in medical wards. All SARI cases admitted during data collection period were eligible for the study.
2. **Controls**, controls were selected randomly among patients with non-respiratory diagnosis admitted at the sentinel hospital during the same time. From a maintained list of non-respiratory patients admitted daily, we selected two controls per each case by simple random method.

3.2.2.5 Variables

3.2.2.5.1 Dependent variable

The study had one outcome/dependent variable namely, severe acute respiratory infection (SARI).

3.2.2.5.2 Independent/Explanatory variables

The independent factors associated with the outcome variables were socio demographic characteristics (age, sex, locality, occupation, education), individual factors such as underlying health conditions (heart disease, kidney disease, diabetes, AIDS, pregnant) and environmental factors including smoking, indoor air pollution and overcrowding.

3.2.2.6 Data collection instruments

We collected data by using structured questionnaires through interview schedule

3.2.2.7 Data collection technique

Interview schedule were used as a data collection technique for this study. The researcher assistants were filling the questionnaires according to the respondent’s response

3.2.2.8 Pretesting of tools

We conducted pretesting of the data collection tools at Maweni regional hospital in Kigoma region

3.2.2.9 Recruitment and training of research assistants

Principal investigator and two researcher assistants collected the data. Researcher assistants were enrolled nurses recruited from health care workers working at Kibondo district hospital. We trained on using data collection tools, interviewing skills as well as confidentiality of the collected information as well as obtaining consent to the study participants

3.2.2.10 Data collection

We used interview schedule to collect the required information among SARI cases and controls who participated in this study by filling the structured questionnaires according to the participant response. The principal investigator and researcher assistants collected data by using the Swahili version questionnaires. Data collected during two months from March to April 2017.

3.2.2.11 Data quality

The principal investigator was responsible for interviewing and supervising the whole process of data collection to avoid protocol interference. Questionnaires were reviewed for consistency and completeness of the responses. Questionnaires with unclear or missing information were identified and the respondent traced for rectification. Data was entered into the epi info version 3.5.4. Data cleaning was done by using epi info before analysis.

3.2.2.12 Data management and analysis

Data collection was done during two months 1st march to 30th April 2017, by the principal investigator and two research assistants. The collected data were checked for completeness and then coded and entered into the computer using dBase4 software. Data cleaning were done, for checking outliers, missing data as well as irrational data using epi info. Also data analysis was done by using both Epi Info version 3.5.1, and Stata software**,** while graphical work was done by using MS excel.

3.2.2.12.1 Descriptive analysis

Descriptive analyses were done to determine frequency distribution of demographic characteristics of the study participants

3.2.2.12.2 Bivariate analysis

The bivariate analysis was done to measure the association between independent variable and dependent variables and statistical significance were kept at $p \leq 0.05$.

The demographic factors, social factors and underlying conditions with p-value ≤ 2 were jointly subjected to multivariate analysis using logistic regression model. The measure of association was odds ratio (OR) with their corresponding (95%) confidence interval. Stratified analyses were done to identify confounders before multivariate analysis being done.

3.2.2.11.3 Multivariate analysis

Multivariate analysis was done by using logistic regression to determine the risk factors associated with the SARI. Variables those were exhibited odds ratio with $P < 0.20$ at bivariate analysis were jointly included in multivariate logistic regression model to determine the factors associated with severe acute respiratory infections (SARI)

3.3 Ethical consideration

We obtained ethical clearance from MUHAS review board. The permission to conduct study was then sought from the region (Kigoma region), and the district authority (Kibondo). The study participants were all informed about the objectives of the study, with the risk and benefits which were well explained. Confidentiality was ensured and right to withdraw at any moment were emphasized with no negative consequences that could follow. Consent form was signed by study participants upon satisfaction to participate in the study. Only participants who signed the consent form were enrolled in the study.

CHAPTER FOUR

4.0 RESULTS

4.1 Retrospective longitudinal study

Socio demographic characteristics of SARI cases

A total of 2705 SARI cases were admitted at Kibondo District Hospital from 2013 to 2015, out of that 2515 (92.5%) were residents of Kibondo district. Majority of the cases were < 5 years (65.2%). The median age was 2 years, range (0.08 -90) years. There was no significance difference between male (50.6%) and female (49.4%) (Table 1).

Table 1: Socio demographic characteristics of the SARI cases, N=2705

Variable	Number (n)	Percentage (%)
Sex		
Female	1242	49.4
Male	1273	50.6
Age group(yrs)		
< 5	1764	65.2
5-24	408	15.1
25-43	193	7.1
≥44	169	6.2
Missing	171	6.3
Division		
Kibondo	2288	91.0
Kifura	169	6.7
Mabamba	58	2.3

Trend of SARI cases admitted at Kibondo Sentinel Hospital

Out of 2705 SARI cases admitted in three years, 47.3% were admitted in 2013, 29.9% in 2014 and 22.8% in 2015. There was a seasonality pattern among SARI cases, with most cases starting from December and peak around February. However this variability was weakly explained over time as shown in trend equations (figure 3).

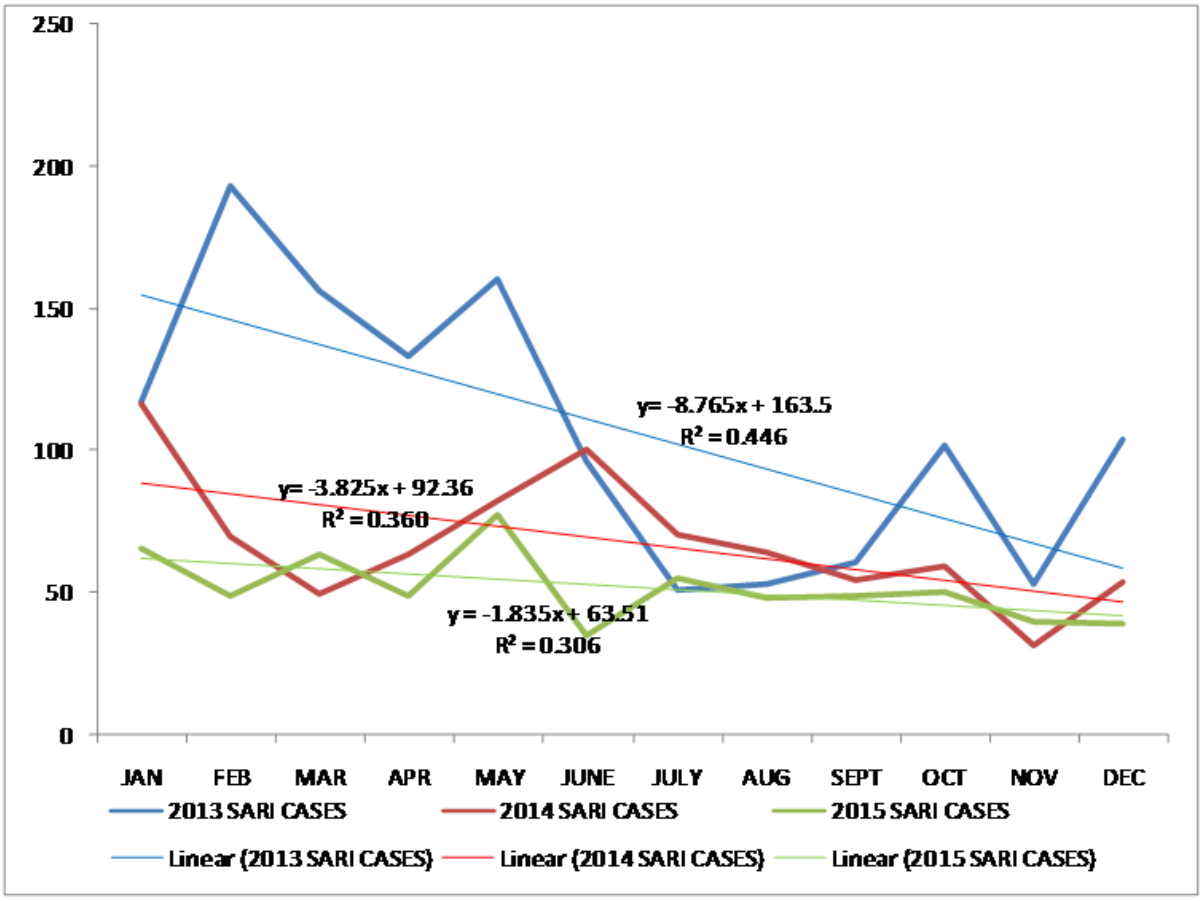


Figure 3: Trend of SARI cases admitted at Kibondo hospital in Kibondo district, Kigoma region, (2013 -2015)

The trend of annual incidence rate of influenza associated SARI

A total of 2515 SARI cases residents of Kibondo district were admitted at the sentinel hospital from January 2013 through December 2015. The overall estimated incidence of influenza associated SARI from 2013-2015 was 317 (95%CI: 274-368) per persons-years. The estimated annual influenza incidence among hospitalized severe acute respiratory infections (SARI) in 2013, 2014 and 2015 were 80 (95%CI: 62-104), 155 (95%CI: 128-190) and 52 (95%CI: 33-82) per 100,000 persons-year respectively. We revealed significant differences among the annual influenza incidences estimated at P-value < 0.0001. Most likely the outbreak started in 2013 and peaked up in 2014. The outbreak dropped in 2015 may be due to some interventions conducted and herd immunity attained among the community. The incidences of influenza associated SARI were higher among children < 5 years old in all 3 years: 277 (95% CI 313-360); 574 (95% CI 479-689) and 136 (95% CI 85-218) compared to person of ≥ 5 years old: 24 (95% CI 14-44); 41(95% CI 25-70) and 24 (95% CI 8-75) per 100,000 persons-years during 2013, 2014 and 2015 respectively (Figure 4).

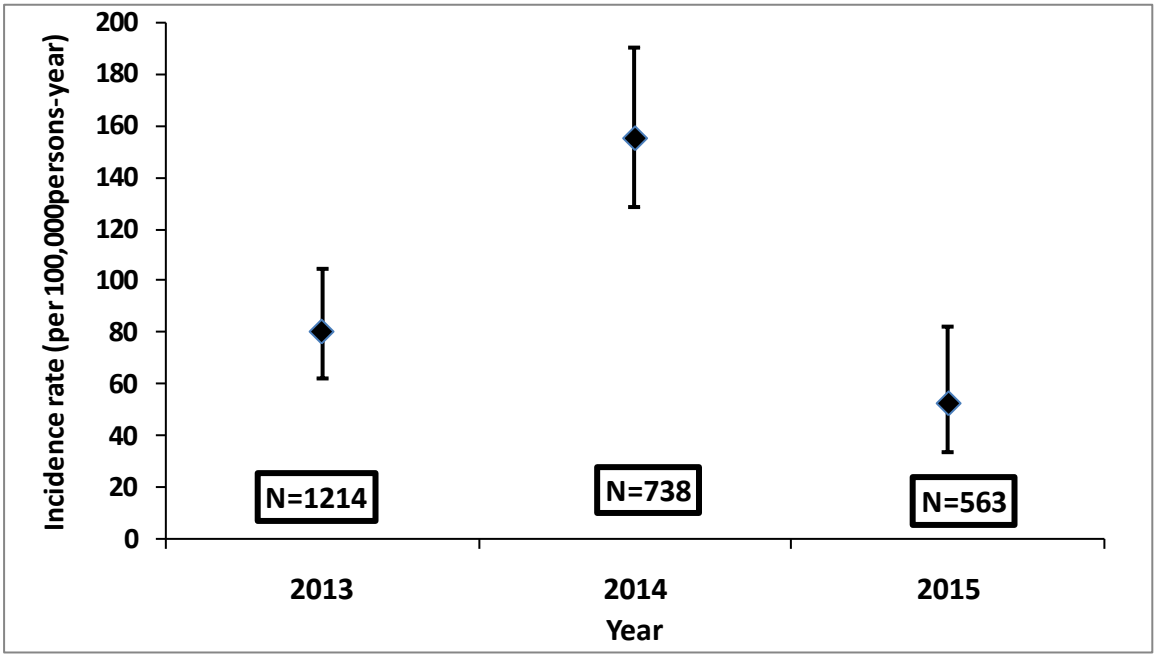


Figure 4 : Influenza incidence rate with 95%CI and the annual number of SARI cases from 2013-2015 at Kibondo District Hospital in Kibondo district council, Kigoma

The trend of annual hospital case fatality ratio at Kibondo district hospital

During January 2013 through December 2015, a total of 2705 severe acute respiratory infections (SARI) were admitted at the sentinel hospital. Specifically, 1279 cases in 2013, out of these 12 cases (0.9%) in-hospital deaths, 810 cases in 2014, out of these 13 cases (1.6%) in-hospital deaths and 616 cases in 2015, out of these 18 cases (2.9%) in-hospital deaths. The overall in hospital case fatality ratio during all years was 1.6%. We found an increasing trend of annual in-hospital case fatality ratio, but the observed difference was not statistical significance. Despite of decreasing annual influenza incidence trend, the annual in-hospital case fatality ratio trend was increasing, this highlight the need of review of case management practices among health care workers at the sentinel site. We revealed higher annual in-hospital case fatality ratio among ≥ 5 years (4.0%), (2.9%) compared to persons of < 5 years old, (2.1% , 1.1%) during 2013 and 2014 respectively. This could be explained by high prevalence of underlying health conditions among persons of ≥ 5 years old. However for 2015, the annual hospital case fatality ratio for < years was higher (1.4) compared to ≥ 5 years (0) (Figure 5).

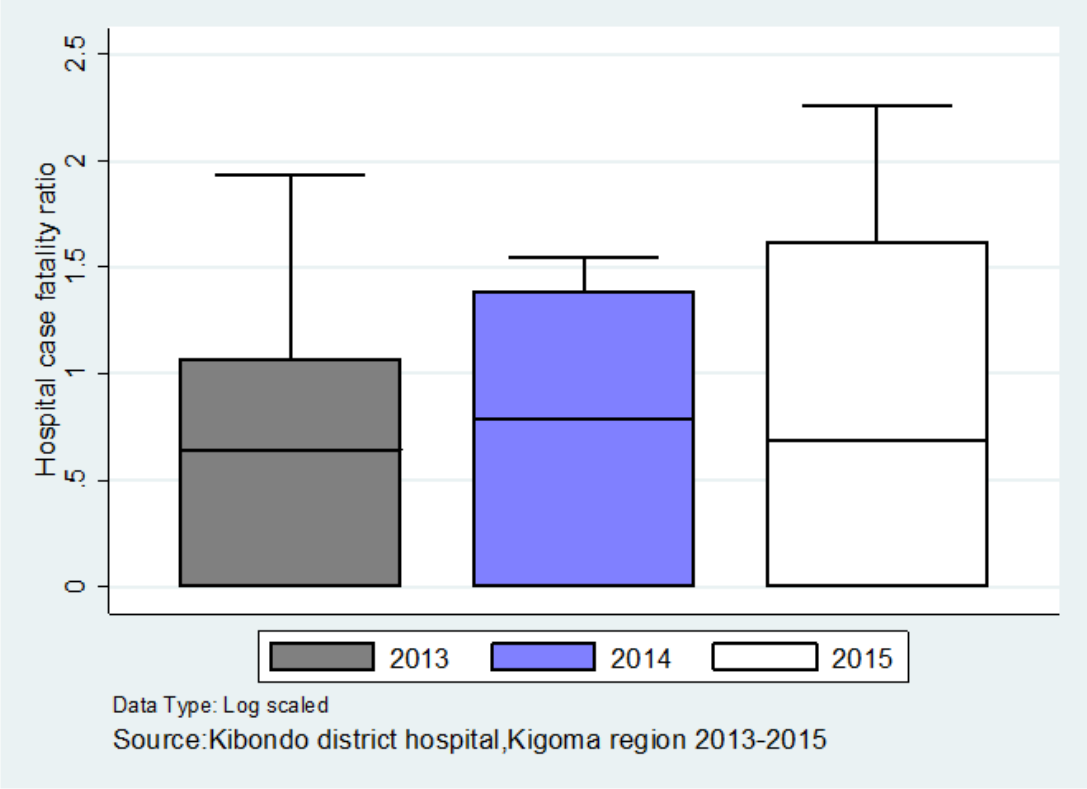


Figure 5: Hospital case fatality rate in Kibondo district hospital, 2013-2015

The trend of annual influenza positivity among SARI cases

A total of 2705 severe acute respiratory infections (SARI) were admitted at the sentinel hospital during all years (2013-2015). Out of 2705 cases, 1002 cases (37%) were taken clinical specimen for influenza virus test. The overall annual percentage influenza positivity from 2013-2015 was 18% (out of 1002 cases from whom specimen was taken, 180 were positive for influenza virus). Specifically, out of 1279 SARI cases, 680 (53.2%) had clinical specimens taken and 60 (8.8%) were positive for influenza in 2013, in 2014, out of 810 SARI cases, 213(26.3%) clinical specimens taken and 101(47.4%) were positive for influenza virus and in 2015, out of 616 SARI cases, 109 (17.7%) clinical specimens were taken and 19 (17.4%) were positive for influenza. We revealed a significant difference between the annual influenza positivity during all years at $p < 0.0001$. Majority of SARI cases, whose samples were tested were positive for FluA in all 3 years. Pandemic influenza virus (A/H1pdm) detected at high level approximately the same as FluA in 2015 (Table 2).

Table 2: Circulating influenza types detected in Kibondo from 2013-2015

Year	FluA	A/H1pdm	A/H3	FluB	Annual % positivity	Samples collected	%Tested
	Pos	Pos	Pos	Pos			
2013	59(8.7%)	37 (5.4%)	16(2.4%)	2(0.3%)	60(8.8%)	680	100
2014	70(32.9%)	1 (0.5%)	68(31.9%)	41(19.2%)	101(47.4%)	213	100
2015	14(12.8%)	13 (11.9%)	2(1.8%)	5(4.6%)	19(17.4%	109	100

4.2 Unmatched case control study

Demographic characteristics of the study participants

A total of 327 study participants were interviewed, 109 were cases and 218 were controls. The mean age of cases was 9.1 years (± 17.7 SD) and for controls it was 20.3 years (± 18.7 SD) for controls. Majority of the cases were male 52.30% while majority of controls were female 63.30%. Table 3 below describes the detailed socio demographic characteristics of cases and controls (Table 3).

Table 3: Socio demographic characteristics of cases (n =109) and controls (n =218)

	Cases		Controls		
Variable	**Number(n)**	**Percentage (%)**	**Number(n)**	**Percentage (%)**	**P-value**
Sex					
Female	52	47.71	138	63.3	0.007
Male	57	52.29	80	36.7	
Age group(yrs)					
< 5	83	76.15	60	27.52	
5-24	10	9.17	95	43.58	<0.001
25-44	7	6.42	38	17.43	
≥45	9	8.26	25	11.47	
Occupation					
child/student	94	86.24	118	54.13	
Peasant	14	12.84	93	42.66	<0.001
Employee/self employment	1	0.92	7	3.21	
Family size					
≤ 3	24	22.02	36	16.51	
4-7	24	22.20	36	16.51	0.15
>7	61	55.96	146	66.97	
Level of education					
Pre primary	88	80.73	69	31.65	
Primary	15	13.76	101	46.33	<0.001
Post primary	5	4.59	42	19.27	
Don’t know	1	0.92	6	2.75	

Bivariate analysis of factors associated with SARI

Bivariate analysis done, revealed that majority of the variables were significantly associated with severe acute respiratory infections (SARI) at p-value < 0.05, (Table 4). Study participants those were coming from household where cooking took place inside the living house (indoor air pollution) were two times more likely to develop SARI compared to those coming from households cooking outside the living house [OR 2.43 (95%CI 1.33-4.46)]. Respondents coming from household spending $\geq$ 2 hours during cooking were two times more likely to develop severe acute respiratory infections (SARI) compared to those coming from households spending < 2 hours during cooking [OR 2.24 (95%CI 1.15-4.34)]. On the other hand respondents who reported to have an active smoker at the household (passive smoking) were twenty five times more likely to develop SARI compared to those without an active smoker at a household [OR 15.22 (95%CI 6.19-37.40)]. Furthermore, study respondents with underlying health conditions were four times more likely to develop severe acute respiratory infections compared to those without underlying health conditions [OR 3.67 (95%CI 1.04-12.97)].

Table 4: Factors associated with SARI at bivariate analysis

Factors	Cases	Controls	cOR	95%CI	P-value
Sex					
Female	52	138	1		
male	57	80	1.89	(1.18-3.03)	0.001
Age group(yrs)					
< 5	83	60	7.51	(2.94-19.19)	< 0.001
5-24	10	95	0.57	(0.20-1.62)	0.287
25-44	7	38	1		
≥45	9	25	1.9	(0.63-6.02)	0.35
Occupation					
Employee/Self employment	1	7	1		
child/student	94	118	5.58	(0.66-47.07)	0.075
Peasant	14	93	1.05	(0.12-9.31)	0.962
Family size					
≤ 3	24	36	1		
4-7	61	146	0.63	(0.34-1.14)	0.124
>7	24	36	1.00	(0.48-2.08)	1.000
Level of education					
Pre primary	88	69	7.65	(0.87-67.58)	0.031
Primary	15	101	0.89	(0.09-7.99)	0.918
Post primary	5	42	0.71	(0.07-7.38)	0.777
Don't know	1	6	1		
Indoor air pollution					
Yes	27	26	2.43	(1.33-4.46)	0.003
No	82	192	1		
Spend more time					
≥2 hours	21	21	2.24	(1.15-4.34)	0.014
< 2 hours	88	197	1		
Passive smoking					
Yes	40	8	15.22	(6.19-37.40)	< 0.001
No	69	210	1		
Underlying health condition					
Yes	7	4	3.67	(1.04-12.97)	0.03
No	102	214	1		
Contacted infected person					
Yes	55	5	43.38	(13.19-142.75)	< 0.001
No	54	213	1		

1: reference group

Stratified analysis

Stratified analysis was done and revealed that there was no confounding variable; furthermore no interaction was seen among the variables associated with severe acute respiratory infections (SARI).

Multivariate analyses findings

At multivariable analysis using unconditioned logistic regression model at p value ≤ 0.05, the significant independent factors associated with severe acute respiratory infections are presented in (Table 5). Study participants those were coming from household where cooking took place inside the living house (indoor air pollution) were two times more likely to develop SARI compared to those cooking outside the living house [OR 2.64 (95%CI: 1.14-6.11)]. On the other hand respondents who reported to have an active smoker at the household (passive smoking) were twenty five times more likely to develop SARI compared to those without an active smoker at a household [OR 25.15 (95%CI: 7.63-82.87)]. Study respondents who reported to contact with a person infected with respiratory infections were fifty five times more likely to develop SARI compared to those did not contact person infected with respiratory infections [OR 55.05 (95%CI: 15.75-192.41))]. Age was found to be significantly associated with SARI; Age group of < 5 years were eighteen times more likely to develop severe acute respiratory infections compared to persons of age group (25-44) [OR 18.93.79 (95%CI: 4.66-76.86)] and age group of ≥45 years were five times more likely to develop severe acute respiratory infections compared to [OR 5.46 (95%CI: 1.06-28.13)]

Table 5: Factors associated with severe acute respiratory infections at multivariate analyses

Factors	Cases	Controls	cOR	95%CI	aOR	95%CI
Sex						
Female	52	138	1		1	
Male	57	80	1.89	(1.18-3.03)	0.91	(0.43-2.10)
Age group(yrs)						
< 5	83	60	7.51	(2.94-19.19)	18.93	(4.66-76.86)***
5-24	10	95	0.57	(0.20-1.62)	0.84	(0.18-3.94)
25-44	7	38	1		1	
≥45	9	25	1.9	(0.63-6.02)	5.46	(1.06-28.13)***
Indoor air pollution						
Yes	27	26	2.43	(1.33-4.46)	2.64	(1.14-6.11)***
No	82	192	1		1	
Spend more time						
≥2 hours	21	21	2.24	(1.15-4.34)	0.67	(0.15-3.06)
< 2 hours	88	197	1		1	
Passive smoking						
Yes	40	8	15.22	(6.19-37.40)	25.15	(7.63-82.87)***
No	69	210	1		1	
Underlying health condition						
Yes	7	4	3.67	(1.04-12.97)	2.7	(0.36-20.45)
No	102	214	1		1	
Contacted infected person						
Yes	55	5	43.38	(13.19-142.75)	55.05	(15.75-192.41)***
No	54	213	1		1	

*****:** Independent factors associated with SARI at multivariate analysis

1: Reference group

CHAPTER FIVE

5.0 DISCUSSION

In this chapter we present the discussions of the findings from the two study components starting with the retrospective longitudinal study aiming at estimating the trend of burden of influenza associated SARI. This component revealed high burden of influenza associated SARI and varying from 2013 to 2015, with the highest incidence in 2014 and the lowest in 2015. We observed higher incidence among children of < 5 years old compared to person of ≥ 5 years old in all 3 years. We also revealed an increasing trend of in- hospital cases fatality ratio during all the 3 years with higher mortality among persons of ≥ 5 years old. The second component present on significant risk factors for severe acute respiratory infections (SARI) which includes; indoor air pollution, passive smoking, age group of children <5 years , age group of ≥ 45 years and contact a person with respiratory infection. In the following subsections those main findings are discussed starting with findings in the first component.

Trend of annual incidence of influenza associated SARI

This study applied World Health Organization Manual for estimating incidence of influenza in sentinel sites. In this study we used data from hospital based surveillance as well as hospital admission survey (HAS) to calculate the population at risk. We revealed varying annual influenza incidence which was highest in 2014 compared to 2013 and 2015. Most likely the outbreak started in 2013 and peaked up in 2014. The outbreak dropped in 2015, this could be attributed with interventions conducted and herd immunity attained among the community. Furthermore, the sharp rise of incidence in 2014 could be attributed by refugees from the neighbor country (Democratic Republic of Congo). The observed magnitude and pattern of influenza incidence associated with severe acute respiratory infections (SARI) was within the range what was reported in Kenya (40). We also found as Children aged < 5 years were hospitalized for influenza in higher rates than people aged ≥ 5 years this finding was in agreement with other studies reported (12,41). However our estimates much lower compared to what reported in Costa Rica and South Africa (31,42). The difference in magnitude of incidence of influenza associated with severe acute respiratory infections (SARI) may be explained by different in methodology being used for

estimation as well as the surveillance system (community based surveillance versus hospital based surveillance).

Trend of annual hospital case fatality ratio

The study revealed an increasing trend of in hospital cases fatality ratio in all 3 years. However the observed difference was not statistical significance. We also found as the in-hospital case fatality ratio was higher among ≥ 5 years compared to persons of < 5 years old. These findings are similar with that reported on systematic review for global and regional burden of hospital admission for severe acute lower respiratory infections in young children, in Africa (43). These findings may be explained by presence of high prevalence of underlying health conditions among ≥ 5 years population as similar findings were reported in South Africa in high HIV- prevalence setting as ≥ 5 years were at high risk for SARI leading to hospitalization and mortality (16).

Trend of annual influenza positivity

The annual influenza positivity among SARI cases revealed in 2013 was almost similar to that reported in 2012 (6). The high level of influenza positivity observed in 2014, could be attributed by refuges entry from the neighbor country (United Democratic of Congo) leading to changes in genetic profile of influenza virus as in 2014, more A/H3 influenza virus were detected. The influenza positivity observed in 2014 was higher than that reported in European nations and North Africa.(18) . The annual influenza positivity observed in 2013 and 2015 was within the range reported in low income countries (11). As regard to seasonality there is a similar pattern across all the years, SARI cases starting from December and peaking around February, this is consistent to what reported as the primary season in African countries along sub Sahara Africa start between January and March (44).

Risk factors associate with SARI

Following subsection presents discussions on the findings on the case control component of the study. We found that passive smoking, indoor air pollution, contact a person with respiratory infections, and age to be associated SARI. Study participants those reported as living with active smoker in a household (passive smoking) were at higher risk for severe acute respiratory infections (SARI) compared to those with no active smoker at their household. Other studies has also reported an association between passive smoking and

severe acute respiratory infections (8,33). We also found that study participants those were coming from households where cooking took place inside the living house (indoor air pollution) were at higher risk for SARI compared to those coming from households where cooking took place outside the living house. These findings are supported by other studies done elsewhere which reported similar association between indoor air pollution and severe acute respiratory infections (8,46,47). When cooking took place in a house they inhaled air with smoke also containing high concentration of pollutants (i.e. CO2, NO2) leading to poor performance of the body immunity and developing other health complications (45). The study revealed that study respondents who reported to had contact with a person infected with respiratory infections were at higher risk of acquiring severe acute respiratory infections compared to those reported had no contact with an infect person. This result supports the transmission of severe acute respiratory infections and influenza in tropical climatic conditions through direct contact transmission (37,48). Direct transmission occurs when there are physical contact between an infected person and a susceptible person. Our results are in line with a study reported in Zambia that having sibling with respiratory infection or mother was a risk for SARI (49). We also found age as a risk factors for severe acute respiratory, children of < 5 years old and adults of ≥ 45 years old were at high risk for severe acute respiratory infections. These findings are in agreement with other studies conducted elsewhere reporting children and old adults being at high risks of SARI(2,14,22–24)

This study had however few limitations. The study was, hospital based and hence may not entirely represent the disease burden in the community due to different health care utilization practices among the community. Secondly, estimation of the population at risk (catchment population for the sentinel hospital) used for calculation of incidence was also based on hospital admission survey, rather than hospital utilization survey and therefore not adjusted for community SARI cases; however it is optional in low income setting. Third, we retrieved secondary data from inpatient registers and other relevant records for extraction of SARI cases missed by influenza surveillance system, consequently surveillance bias was unavoidable due misclassification of patients with severe acute respiratory diagnosis and causes of deaths among patients admitted with acute respiratory infections

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Our study found substantive influenza burden leading to hospitalization and mortality in Kibondo district during all 3 years. The seasonality pattern among SARI cases starting from December and peak around February. The incidence of influenza associated SARI was higher for children < 5 years old compared to persons of age group ≥ 5 years old. The most predominant influenza type detected in both years was FluA as well as high detection of A/H1pdm seen in 2015. The hospital case fatality ratio was increasing in the three years with more deaths occurring among ≥ 5 years. Indoor air pollution, passive smoking, age group of < 5years and ≥ 45 years and contact a person with history of respiratory infections were the risk factors for severe acute respiratory infections (SARI).

6.2 Recommendations

This study highlights the need of preventives programs for addressing all risk factors associated with severe acute respiratory infections (SARI) including indoor air pollution and smoking. Review of case management practices and further studies to explore other causes of SARI apart from influenza virus, explore country wide influenza burden and causes of deaths among older people and < 5 years children with SARI**.** The preventive programs should consider children < 5 years as the highest risk age group for influenza associated SARI.

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APPENDICES

Appendix 1a: Questionnaire English version

QUESTIONNAIRE FOR ASESSING FACTORS ASSOCIATED SEVRE ACUTE RESPIRATORY INFECTIONS IN KIBONDO DISTRICT, KIGOMA REGION-2017.

Date of interview: ……/……./……

Hospital admission number…….....District…….Ward…….

Study Participant Identification Number (Id no.):Circle which is applicable.

Case…… (0) Control 1…….(1) Control 2…….(2) ☐

Pair Identification Number (Pid no.).Fill at the right place.

1.Case number ☐☐☐ 2.Control 1 for case number ☐☐☐ 3. Control 2 for case number ☐☐☐

SOCIO DEMOGRAPHIC CHARACTERISTICS:

1. What is your age (years)? ☐☐

2. What is your gender? (circle which is applicable) ☐

1. Male 2. Female

3. What is the highest level of education you have completed?(Circle which is applicable)

0. Pre-primary 1.Primary

2. Post primary training 3.Secondary 'o' leve ☐

4.Post secondary 'o' level training 5.Secondary 'a' level

6.Post secondary 'a' level training 7.University 8. Don't know

4. The village of residence? ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

5. How many children under 16 years old live in your household? ☐☐

6. What is your occupation? (Circle which is applicable)

1. Peasant 2. self employment 3. Employee ☐

4. Student 5. Others, specify?…….

7. Health status: Is the study participant affected with respiratory infection?

1. Yes 2. No ☐

8. What is your marital status?

1. Single 2. Married 3.Widowed ☐

4. Divorced 5. Living with partner

CLINICAL INFORMATION OF THE PATIENT:

9. Symptoms (sellect which apply)

1. Fever (T > 37.5℃)	Yes ☐	No ☐	2. Cough	Yes ☐	No ☐
3. Shortness of breath	Yes ☐	No ☐	4. Difficult breathing	Yes ☐	No ☐
5. Runny nose) discharge	Yes ☐	No ☐	6.History of fever	Yes ☐	No ☐
7. Wheezing	Yes ☐	No ☐	8. Headache	Yes ☐	No ☐
9. Joint pains	Yes ☐	No ☐	10. Muscles aches	Yes ☐	No ☐
11. Diarrhea	Yes ☐	No ☐			

Additional symptoms fo 2months to 4 years children.

12. Convulsions	Yes ☐	No ☐
13. Unable to drink/ breastfeed at all	Yes ☐	No ☐
14. Letharg/ Unconsciousness	Yes ☐	No ☐

10.Clinical signs **(** sellect which apply**)**

1.Conjunctivitis	Yes ☐	No ☐	2. Nasal discharge	Yes ☐	No ☐

3. Nasal Flaring Yes ☐ No ☐ 4. Stridor in a calm child Yes ☐ No ☐

5. Erythematous oropharynx Yes ☐ No ☐ 6. Grunting Yes ☐ No ☐

7. Chest indrawing Yes ☐ No ☐ 8.Tachypnea Yes ☐ No ☐

UNDERLYING HEATH CONDITIONS: (sellect which is applicable)

11. Do you have any of the following underlying health conditions?

1.Heart disease Yes ☐ No ☐ 2. HIV)AIDS Yes ☐ No ☐

3. Asthma Yes ☐ No ☐ 4. Chronic lung disease Yes ☐ No ☐

5.Chronic liver disease Yes ☐ No ☐ 6. Diabetes Yes ☐ No ☐

7. Pregnancy Yes ☐ No ☐ 8.Neuromuscular dysfunction Ye ☐ No ☐

9. Active smoker Yes ☐ No ☐ 10. Chronic kidney disease Yes ☐ No ☐

11. Chronic hematological disorder Yes ☐ No ☐

12. Vaccinated for the past 12 months Yes ☐ No ☐

OUTCOME

12. The outcome of a diseased study participant

1.Discharged 2. Died ☐

13. What was the discharge/death diagnosis?

1.Pneumonia Yes ☐ 11. Upper respiratory infection Yes ☐

2.Wheezing/bronchospasm Yes ☐ 12.Otitis media Yes ☐

3. Conjuctivitis Yes ☐ 13. Meningitis Yes ☐

4. Dehydration Yes ☐ 14. Pharyngitis/tonsilitis Yes ☐

5. Malaria Yes ☐ 15. Diarrhoea/gastroenteritis Yes ☐

6. Viral syndrome	Yes	☐	16. Dysentery	Yes	☐
7. Intestinal worms	Yes	☐	17. Anaemia	Yes	☐
8. Malnutrition	Yes	☐	18. Oral candidiasis	Yes	☐
9. Amobiasis	Yes	☐	19. Rash/skin problem	Yes	☐
10. Scabies	Yes	☐	20. Wound/ injury	Yes	☐

RISK FACTORS

14. How many people are living at your household? ☐☐

15. In your household , is there any one smoking? (Circle which is applicable)

1.Yes 2.No ☐

16. In your household, what kind fuels do you use for cooking? (Circle which is applicable) 1.Stove 2. Charcoal 3. Firewood 4.Stove & firewood 5.Stove &Charcoal ☐

6.Charcoal & firewood 7.Both 8. Other, specify?.....

17. Where is cooking done at your household?

1. Inside the house 2. Outside the house 3. Both ☐

18. On average, how many hours do you spend in cooking area while the food is being Cooked? ☐☐ Hours

19. Had a contact with a person with respiratory infection in the past seven (7) days?

1. Yes 2.No ☐

20. had a contact with a person died with respiratory infection or breathing problem in the past seven (7) days? 1. Yes 2.No ☐

21. Do you drink any kind of alcoholic beverage?

1. Yes 2. No ☐

22. If yes, how many days in a week do you drink alcoholic beverage? ☐☐

23. On average how many bottles of alcoholic beverage you drink in a night? ☐☐ Bottle

24. If female case, were you pregnant at the time you were admitted to the hospital?

1. Yes 2. No 3. Don't know ☐

25. If yes, how many months were you? ☐☐ Months

26. Did your household own one the following animals during the period before you become ill?

ANIMAL	NUMBER OWNED BY HOUSEHOLD	KEPT INSIDE THE HOUSE?	SICK OR DYING ANIMALS?	CLOSE CONTACT OR TOUCHING	FREQUENCE OF CONTACT WITH ANIMALS
Chicken	☐☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Very frequent 2.Frequent 3.Not frequent 4.None ☐
Ducks	☐☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Very frequent 2.Frequent 3.Not frequent 4.None ☐
Cows	☐☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Very frequent 2.Frequent 3.Not frequent 4.None ☐
Sheep	☐☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Very frequent 2.Frequent 3.Not frequent 4.None ☐
Dogs	☐☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Yes 2.No 3.DN ☐	1.Very frequent 2.Frequent 3.Not frequent 4.None ☐

Pigs		1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Very frequent 2.Frequent 3.Not frequent 4.None
Cats		1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Very frequent 2.Frequent 3.Not frequent 4.None
Donkeys		1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Very frequent 2.Frequent 3.Not frequent 4.None
Others, Specify					
		1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	1.Very frequent 2.Frequent 3.Not frequent 4.None
		1.Yes 2.No 3.DN	1.Yes 2.No 3.DN	Yes No DN	1.Very frequent 2.Frequent 3.Not frequent 4.None

Appendix 1b: Questionnaire Swahili version

DODOSO LA UTAFITI KUHUSU KUTAMBUA SABABU ZINAZOHUSISHWA NA MAGONJWA YA MFUMO WA UPUMUAJI KWA WAGONJWA WANAOLAZWA KATIKA HOSPITALI YA WILAYA KIBONDO, MKOA WA KIGOMA-2017.

Tarehe ya Kuhojiwa ☐☐ / ☐☐ / ☐☐☐☐

Namba ya utambulisho

hospitalini……Wilaya…….Kata……..

Namba ya utambulisho wa mshiriki: Chagua inayohusika ☐

Mshiriki aliyemgojwa (0) Mshiriki asiyemgonjwa (1) Mshiriki asiyemgonjwa (2)

Utambulusho wa mshiriki mgonjwa na wawili wasio wagonjwa.

1.Mshiriki mgonjwa namba ☐☐☐ 2. Asiye mgonjwa 1 kwa mgonjwa namba ☐☐☐

3.Asiye mgonjwa 2 kwa mgonjwa namba ☐☐☐

TAARIFA MUHIMU ZA MSHIRIKI

1. Umri wako kwa sasa? Miaka ☐☐

2. Jinsia yako ? (chagua inayohusika) ☐

1. Mme 2. Mke

3. Kiwango chako cha juu cha elimu uliyomaliza?(Chagua inayohusika) ☐

0.Chekechea 1. Elimu ya msingi

2.Mafunzo baada S/msing 3. Kidato cha nne

4.Mafunzo baada kidato cha nne 5. Kidato cha sita

6.Mafunzo baada ya kidato cha sita 7.Chuo kikuu 8. Sijui

4. Kijiji unachoishi kwa sasa? ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

5.Watoto wangapi wenye umri chini ya miaka 16 wanaishi katika kaya yako? ☐☐

6. Unafanya kazi gani ya kukupatia kipato? (Chagua ambayo ni husika)

1.Mkulima 2.Ajira binafsi 3.Mfanyakazi ☐

4. Mwanafunzi 5.Nyingine,

taja?.....

7. Hali ya ugonjwa: je mshiriki anaumwa ugonjwa wa mfumo wa upumuaji?

1. Ndiyo 2.Hapana ☐

8. Hali yako ya ndoa?

1. Sijaoa/sijaolewa 2. Nimeoa/Nimeolewa 3. Mjane ☐

4. Kuachika 5. Kuishi na mpenzi

9. Dalili za kuumwa? (Chagua inayohusika N-ndiyo, H-hapana)

1.Homa kali (Joto > 37.5℃)	N ☐	H ☐	2. Kikohozi	N ☐	H ☐
3. Upungufu wa kupumua	N ☐	H ☐	4.Kupumua kwa shida	N ☐	H ☐
5.Kutokwa na uchafu puani	N ☐	H ☐	6.Historia ya homa	N ☐	H ☐
7.Kupumua kwa kukoroma	N ☐	H ☐	8.Maumivu ya kichwa	N ☐	H ☐
9.Maumivu kwenye viungo	N ☐	H ☐	10.Maumivu ya misuli	N ☐	H ☐
1.Kuhara	N ☐	H ☐			

Dalili zingine za kuumwa kwa watoto wa miezi miwili (2) hadi miaka minne (4)

12.Degedege	N ☐	H ☐
13.Kushindwa kula/kunyonya	N ☐	H ☐
14. Hajitambui	N ☐	H ☐

10.Dalili za kuonekana kwa mgonjwa (chagua inayohusika N-ndiyo, H-hapana)

1.Ugonjwa wa macho(kiwambo) N ☐ H ☐ 2. Kutoka uchafu puani N ☐ H ☐

3. Kubonyea kwa pua N ☐ H ☐ 4. Kupumua kwa kukoroma N ☐ H ☐

5.Tonsil kuvimba, kuwa nyekundi N ☐ H ☐ 6. Kunung'unika N ☐ H ☐

7.Kubonyea kwa kifua N ☐ H ☐ 8.Kupumua kwa shida, taratibu N ☐ H ☐

HALI YA KIAFYA YA MSHIRIKI/ MAGONJWA MENGINE (N-ndiyo, H-hapana)

11.Kati ya magonjwa yafuatayo, ni ugonjwa upi uliowahi kuugua?

1. Ugonjwa wa moyo N ☐ H ☐ 2. Ukimwi N ☐ H ☐

2. Ugonjwa wa pumu N ☐ H ☐ 4. Ugonjwa wa mapafu N ☐ H ☐

5. Ugonjwa wa ini N ☐ H ☐ 6.Ugonjwa wa kisukari N ☐ H ☐

7. Mjamzito N ☐ H ☐ 8.Misuli kushindwa kufanya kazi N ☐ H ☐

9. Unavuta sigara N ☐ H ☐ 10. Ugonjwa wa figo N ☐ H ☐

11. Mchafuko wa damu usio wa kawaida N ☐ H ☐

12. Chanjo ya mafua miezi 12 iliyopita N ☐ H ☐

MATOKEA BAADA YA KULAZWA

12.Matokeo kwa mgonjwa aliyelazwa kwa tatizo la ugonjwa wa mfumo wa upumuaji (kukohoa, mafua, na shida ya kupumua)?

1. Amepona na kuruhusiwa 2. Amefariki ☐

13. Aina ya ugonjwa wakati wa kuruhusiwa/ kufariki kwa mgonjwa? (N-Ndiyo,)

1.Kichomi cha mapafu N ☐ 11. Maambukizi ya njia za hewa N ☐

2.Kupumua kwa kukoroma N ☐ 1 2.Ugonjwa wa sikio N ☐

3. Ugonjwa wa macho N ☐ 13.Homa ya uti wa mgongo N ☐

4. Upungufu wa maji N ☐ 14.Uvimbe wa koromeo N ☐

5. Malaria N ☐ 15.Kuhara N ☐

6. Dalili za virusi mbalimbali N ☐ 16. Kuhara damu N ☐

7.Minyoo N ☐ 17.Upungufu wa damu N ☐

8.Utapiamlo N ☐ 18.Vidonda vya mdomoni N ☐

9. Amoeba N ☐ 19.Ugonjwa ya ngozi N ☐

10.Ugonjwa wa upele N ☐ 20. Kidonda N ☐

SABABU HATARISHI ZINAZOHUSISHWA NA UGONJWA

14. Idadi ya watu wanaoishi katika kaya yako? Watu ☐☐

15. Katika kaya yako , kuna mtu yeyote anayevuta sigara? (Chagua inayohusika)

1.Ndiyo 2.Hapana ☐

16. Katika kaya yako, nishati gani wanatumia kupikia ? (Chagua inayohusika)

1.Jiko la mafuta 2. Jiko la mkaa 3. Kuni 4.Jiko la mafuta na kuni ☐

5.Jiko la mafuta na mkaa 6. Mkaa na kuni 7. Nyingine, taja?.....

17. Katika kaya yako ni sehemu gani mnapikia chakula?

1. Ndani ya nyumba 2. Nje ya nyumba 3. Sehemu zote ☐

18. Kwa wastani, mnatumia masaa mangapi katika sehemu ya kupikia wakati wa kupika?

Masaa ☐☐

19. Umewahi kushikana au kugusana na mtu yeyote mwenye matatizo ya mfumo wa upumuaji (kukohoa, mafua, shida ya kupumua) ndani ya siku Saba (07) zilizopita?

1. Ndiyo 2. Hapana ☐

20. Umewahi kushikana au kugusana na mtu aliyekufa Kwa ugonjwa wa mfumo wa upumuaji (kukohoa, mafua au shida ya kupumua) ndani ya siku Saba zilizopita?

1. Ndiyo 2. Hapana ☐

21. Huwa unatumia vinywaji venye kilevi? ☐

1. Ndiyo 2.Hapana

22. Kama ni Ndiyo, siku ngapi katika wiki hutumia vinywaji? Siku ☐☐

23. Wastani kwa siku huwa unatumia chupa ngapi za vinywaji venye kilevi? Chupa ☐☐

24. Kwa mgonjwa wa kike, wakati unalazwa hospitalini ni mjamzito?

1. Ndiyo 2. Hapana 3. Sijui ☐

25. Kama mama ni mjamzito, mimba ina miezi mangapi? Miezi ☐☐

26. Katika ngazi ya kaya, uwepo wa wanyama wafuatao kabla ya kuugua?

(N-Ndiyo, H- Hapana, S-Sijui)

Wanyama	Idadi ya wanyama katika kaya	Wanyama wanalazwa ndani ya nyumba	Wanyama waliougua au kufa?	Kuwa karibu au kugusana na wanyama?	Makadirio ya kuwa karibu/ kugusana na wanyama kwa wiki
Kuku	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna
Bata	☐☐	1.N 2.H ☐ 3.H	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna
Ng'ombe	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara ☐ 4.Hakuna
Kondoo	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna

Mbwa	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Mara kwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna
Nguruwe	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna
Paka	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna
Punda	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna
Nyingine, Taja?					
	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna
	☐☐	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.N 2.H ☐ 3.S	1.Mara kwa mara sana 2.Marakwa mara ☐ 3.Siyo mara kwa mara 4.Hakuna

APPENDIX 2a: CONSENT (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

DIRECTORATE OF RESEARCH & PUBLICATIONS

ID-NO…….

Consent to collect data for this study

Greetings, my name is ……..From Muhimbili University of Health and Allied Sciences, Dar es Salaam. At the moment, we are carrying out a study to determine the factors associated with severe acute respiratory infections in Kibondo district, Kigoma region.

Purpose of the study

This study aims to collect information on medical burden of influenza associated SARI and their associated factors. You are being asked to participate in this study as stakeholder and a resident from the study site. You are being asked to participate in this study because your knowledge and experiences are very important for this study.

What participation involved

If you agree to participate in this study, you will be required to answer series of questions that have been prepared for the study through interviewing in order to obtain the intended information regarding factors related to severe acute respiratory infections in Kibondo district, Kigoma region.

Confidentiality

I assure you that all the information collected from this study will be kept confidential. Only people working in this research study will have the success to the information. We will ensure that any information collected from the patient file does not identify the patients name or other identifying information on the records of the information will collected.

Risks

No any risk is foreseen in this study.

Right to withdraw and alternatives

Taking part in this study is completely your choice. If you choose not to participate in the study or if you decide to stop participating in the study you will not get any harm. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty or loss of any benefits to which you are otherwise entitled.

Benefits

The information that will be collected is extremely important and valuable. It will help policy maker and other health official at every level to improve or otherwise rectify logistics and circumstances in favor of service utilizer's. There are no direct benefits however; individual benefit it will be obtained through intervention programs which can be conducted in this particular area.

Responsibility of investigator

Provide advice to both patients with severe acute respiratory infections and those with non respiratory infections on the significance seeking medical care early to avoid severe outcomes of the disease leading to loses on production and increased medical costs due to hospitalization.

In case of injury

We are not anticipating that any harm will occur as the result of data collection in this study

Who to contact:

If you ever have questions about this study, you should contact the study coordinator or principal investigator, **JOHN NSOMI SAGAIKA, the principal investigator**, MUHAS, P.O.BOX 65001.Dar es salaam.Tel:0787 383494/ 0762430130.

If ever have questions about your rights as a participant you may call **Dr Joyce Rose Masalu**, Acting Chairperson of the senate Research and Publication Committee, P.O.BOX 65001, Dar es Salaam. Tel: 2150302-6, 2152489.

Signature:

Do you agree?

Participant agrees……, Participant does NOT agree……..

I _____ have read/understood the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of the participant _____

Signature of research assistant _____

Date of signed consent _____

APPENDIX 2b: CONSET (Kiswahili version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI

KURUGENZI YA UTAFITI NA MACHAPISHHO

Namba ya utambulisho…….....

Ridhaa ya kukusanya takwimu kwa utafiti huu.

Habari!

Jina langu naitwa ……..natoka chuo kikuu cha sayansi za Afya Muhimbili, Dar es Salaam. Tunafanya utafiti wa kutambua mzigo wa matibabu unaotokana na ugonjwa wa mafua unaohusishwa na magonjwa ya mfumo wa upumuaji yanayopelekea wagonjwa kulazwa hospitalini, pamoja na kupoteza maisha na kutambua sababu zinahusiana, kwa wagonjwa wote waliolazwa na maradhi ya mfumo wa upumuaji katika wilaya ya Kibondo, Mkoa wa Kigo

Lengo la utafiti.

Utafiti huu unalengo la kukusanya taarifa za magonjwa ya mfumo wa upumuaji yanayohusishwa na mafua kwa wagonjwa wote wanaolazwa kwa magonjwa ya mfumo wa upumuaji ili kujua mzigo wa matibabu na sababu zinazohusiana katika wilaya ya Kibondo, Mkoa wa Kigoma.

Nini kinahitajika ili kushiriki

Ili kushiriki katika utafiti huu inabidi kukubali na kujiunga kwa kujibu maswali toka kwenye dodoso wa kwa ajili ya utafiti huu.

Usiri.

Nakuhakishia kuwa taarifa zote zitakazokusanywa kutoka kwako kupitia dodoso hili zitakuwa siri na hakuna mtu yeyote ambaye hafanyi kazi kwenye utafiti huu ataambiwa.Taarifa ya utafiti huu haitataja jina lako wala utambulisho wowote hautowekwa kwenye taarifa unayotoa. Taarifa zako zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho.

Madhara

Hakuna madhara yeyote yanayotegemewa kutokea kutokana na utafiti huu.

Haki ya kujitoa au vinginevyo

Ushiriki wako katika utafiti huu ni hiari. Kutoshirika au kujitoa kwenye utafiti huu hakutakuwa na adhabu yeyote na hautapoteza sitahiki zako endapo utaona ni vema kufanya hivyo.

Faida

Taarifa zitakazokusanywa ni muhimu sana na zenye thamani sana kwa kuwa zitasaidia kujua mzigo wa matibabu unaotokana na mafua yanahusiana na magonjwa ya mfumo wa upumuaji , kuweza kupanga mikakati thabiti ya kuzuia na kutibu mafua katika nchi yetu. Pia zitasaidi kuweka mikakati ya kuboresha ufuatiliaji wa ugonjwa wa mafua katika vituo vilivyoanishwa na kuongeza vingine kutokana na ukubwa wa tatizo.

Wajibu wa mtafiti

Wagonjwa wote na wasio wagonjwa wa magonjwa ya mfumo wa upumuaji watapewa elimu ya kuwahi kupata matibabu pindi wanapopatwa na magonjwa hayo ili kuweza kuzuia kufikia katika hali ya kulazwa unaopelekea kupoteza muda wa uzalishaji na gharama kubwa za matibabu.

Endapo utaumia

Hatutegemei madhara yeyote katika ukusanyaji wa takwimu katika utafiti huu.

Watu wa kuwasiliana nao

Kama una maswali katika utafiti huu usisite kuwasiliana na **JOHN NSOMI SAGAIKA**, Mtafiti mkuu, chuo kikuu cha Muhimbili, S.L.P 65001, Dar es Salaam (simu namba, 0787383494/ 0713485120)

Kama una swali lolote kuhusu haki zako, wasiliana na **Dr. Joyce Rose Masalu**, kaimu mwenyekiti wa kamati ya utafiti na machapisho, S.L.P 65001, Dar es Salaam. Tel: 21503002-6, 2152489

Mimi ……..nimesoma, nimeelewa hii fomu, maswali yangu yamejibiwa . Nakubali kushiriki katika utafiti huu.

Sahihi za mshiriki……..

Sahihi ya mtafiti msaaidizi…….

Tarehe ya kutia sahihi fomu ya ushiriki……

Appendix 3: MUHAS ethical clearance

OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

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Ref. No. MU/ PGS/SAEC/Vol. XVI/ 29th December, 2016

Mr. John N. Sagaika
MSc. Epidemiology and Laboratory Management
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED:"BURDEN OF INFLUENCA AND ASSOCIATED FACTORS IN KIBONDO DISTRICT"

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from 28th December, 2016 to 27th December 2017. In case you do not complete data analysis and dissertation report writing by 27th December, 2017 you will have to apply for renewal of ethical clearance prior to the expiry date.

Prof. Andrea B. Pembe
DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Public Health and Social Sciences