Original Research Article

Risk Factors for Influenza Disease inShai-Osudoku and Ningo-Prampram Districts in the Greater Accra Region of Ghana

ABSTRACT

Aims: This study sought to determine the risk factors of Influenza by investigating the characteristics of patients with Acute Respiratory Infections (ARIs).

Study Design: Anunmatchedcase-control study.

Place and Duration of Study: Thiswas conducted among residents of Shai-Osudoku (SO) and Ningo-Prampram (NP) Districts from April to November 2016.

Methods: Prospective cases of ARIs from a facility-based sentinel surveillance on respiratory illnesses were screened for Influenza-Like-Illnesses (ILIs). Respiratory samples were obtained from those meeting the case definition for ILI and investigated. A total of 147 samples were influenza virus-positive and selected as case-patients. Another 294 patients were selected as control-patients from the pool of influenza negative tests. These two groups were used to assess the risk factors of influenza. Crude and adjusted odds ratios were calculated. A purposive selection logistic regression was used for the adjusted modelling.

Results: The study identified Influenza A(H3N2) and Influenza B as the predominant circulating influenza viruses. Study participants had poor knowledge on the causes and prevention of acute respiratory illness. After the multivariate analysis, ILI patients presenting with Chills had 4 times odds (aOR:4.57; 95%CI: 1.51 – 13.76) of having influenza as compared with the controls. In addition, ILI patients with recent travel history in past 2 weeks had 3 times odds (aOR:3.05; 95%CI: 1.07 – 8.73) of being infected with the influenza virus compared with controls with no history of travel.

Conclusion: The study provided clues for increasing the index of suspicion of clinicians in identifying patients with respiratory signs who could be at risk of influenza infection. Communication of the significant risk factors identified in the study to all health workers should be prioritized as an action. This important knowledge about factors associated with influenza among ILIs will inform early detection and appropriate health interventions to reduce the burden influenza disease.

Keywords: Influenza-Like Illness, Influenza, Risk Factors, Ghana

1. INTRODUCTION

Acute Respiratory Infection (ARI) is manifested by cough accompanied by short rapid breathing which may be associated with death especially when there are other co-morbidities[1].The influenza virus is an important aetiology behind ARIs, and itsconsequences for public health remains high[2].

Symptoms of influenza infection include fever, cough, sore throat, sneezing, rhinorrhea, nasal congestion, headache, malaise, myalgia, nausea, vomiting and diarrhea. These are non-specific and can be caused by numerous respiratory viruses[3]. Influenza A and B viruses are responsible for most influenza-like illnesses (ILIs), but other pathogens including influenza C viruses, parainfluenza viruses, respiratory syncytial viruses, rhino viruses and mycoplasma pneumoniae are also important[4].

Comment [NF1]: bacteria, and other non communicative respiratory problems can show the symptoms. So it is better if you add them here.

The emergence of a novel influenza virus could cause wide-spread local outbreaks or even a pandemic. Ghana had its fair share of the influenza pandemic of 1918–19, during the pre-independence era [5].

Seasonal influenza remains a public health problem, causing severe illness in about 3–5 million people and responsible for 290 000–650 000 deaths worldwide each year [6]. It is estimated that 20% of children and 5% of adults globally present with influenza annually [2].

A systematic review (1980 to 2009) on assessing influenza disease burden, influenza epidemiology and issues related to public health policy in sub-Saharan Africa, found that about 16% of children had ARI and was attributable to influenza [7].Also, populations in sub-Saharan Africa are more vulnerable to influenza related complications because of the high prevalence of underlying health problems and limited access to healthcare [8].

.Ntiri et al. (2016) in a study at SO and NP Districts in Ghana reviewed the records of 2,322 ILI patients tested from 2014 to 2016. It was observed 407 (18%) were positive for influenza [9]. This study estimated the incidence of influenza-associated ILI as 844/100,000 persons (95% CI: 501-1,099).Clinically diagnosed respiratory illnesses have ranked second among the top ten causes of hospital attendance in the SO and NP Districts from 2012 to 2016 from annual reports of the districts.

Comment [NF2]: prevalence is more sounded. Because incidence is linked per time unit.

Influenza viruses have the proclivity to infect persons in any age group but have the highest frequency of infection in children less than 5 years and adults more than 65 years of age.Rates of serious illness and death are relatively higher among individuals more than 65 years of age, children less than 2 years of age and persons of any age who have underlying medical conditions that can increase the risk of complications from influenza[10]. Where influenza infection is healthcare-associated, it can be a substantial cause of morbidity and mortality among adult patients with adverse outcomes, including secondary pneumonia, prolonged stay and death [11].

The absence of adequate information about the risk factors associated with Influenza-positive infection in Ghanaaffects the application of appropriate public health measures to reduce morbidity and mortality from Influenza-Like Infections.

The purpose of this study was, therefore, to establish the risk factors associated with influenza positive infection among ILI patients, and use the information obtained for advocacy, and reduce the exposure to identified risk factors among vulnerable populations.

2. MATERIALS AND METHODS

Study Design

A health facility-based case-control study was carried out to determine the risk factors for influenza infectionusing ILI patients. The influenza positives ILIs were the case-patients and the influenza negative ILI patients served as controls. This was preceded by review of health facility data to determine the proportion of ILIs among outpatientsin SO and NP Districts.

Study Area

The study was conducted in Shai-Osudoku and Ningo-Prampram Districts found in the Greater Accra Region. These two districts have a total land area of about 1,442 square kilometers. The district capital of Shai-Osudoku (Dodowa) is about 40 kilometres from Accra in a northeast direction, whereas the capital of Ningo-Prampram (Prampram) is about 50 kilometres eastwards from Accra. The study area is located in one of the hottest and driest parts of the country. Temperatures are noticeably high for greater parts of the year with the highest (40^0C) during the dry season (November-March) and the lowest (22^0C) during the short wet season (June-August). Mean annual rainfall rises from 762.5 mm at the coast to 1,220 mm to the north [12].

The two districts have a combined population of 143,092 for 2016 as per estimates provided by Center for Health Information Management, with 52 health facilities. The ratio of males to females was 92:100. There were 24,221 households documented by the Dodowa Health Research Center scattered in 382 communities. The age-sex structure of the population has a wide base, composed of children at younger ages. There are more females than males at advanced years [13, 14].

The Ghana Health Service (GHS), in collaboration with the Noguchi Memorial Institute for Medical Research (NMIMR) and the United States Centers for Disease Prevention and Control (CDC) Atlanta, established a sentinel surveillance platform for Acute Respiratory Infections in Shai-Osudoku and Ningo-Prampram Districts of the Greater Accra Region, Ghana. This surveillance platform was used to investigate the risk factors for Influenza infection. The study location is in the south eastern part of Ghana (Fig. 1.0)

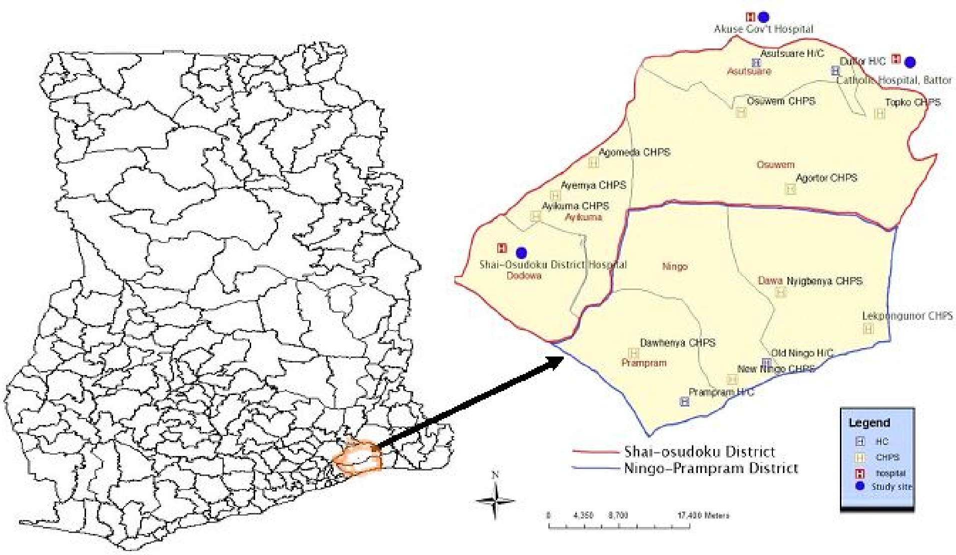


Fig. 1. Map of Shai-Osudoku and Ningo-Prampram Districts indicating study sites

Variables

The independent variables were grouped into individual, socio-economic and environmental risk factors. The variables grouped as individual were age, sex, and pre-existing medical condition, signs and symptoms, vaccination status and cigarrete smoker. Under the socio-economic category were occupation and literacy level of caregiver, educational status, marital status, perception of cause of illness, occupation and household wealth index. The environmental risk factors included exposure to indoor biomass fuels, number of people in household (overcrowding) and smoking (passive). The key outcome variable of interest was influenza-positive ILI.

Study Population

The study population were residents of SO and NP Districts with ILI seeking medical care. Residents were those who had stayed in the study area for the past 6 months at the inception of the study.

Sample size

One hundred and forty-seven influenza virus-positive ILI case-patients and 294 influenza virus-negative ILI controls were selected. It was assumed 27.5% of cases and 16.0% of controls will have a past exposure to a risk factor for influenza-positive ILI, with an expected odds-ratio of 2.0 and power of 80%. All the above parameters hold true using the Fleiss approach in the StatCalc of Epi-Info version 3.5.1.

Sampling Method

ILI was defined as any person with sudden onset of fever (history/measured) of $\geq 37.5^0$C (axillary) and cough and/ or other respiratory signs with onset within the last 10 days [15]. OPD patients at the participating health facilities were screened for ILIs.

The influenzapositive ILIs were then identified as case-patients for a 1:2 unmatched case-control study, where the controls were influenza-negative ILIs selected from the pool of influenza-negative samples. The case-patients tested positive for influenza virus via real-time reverse transcription PCR (rRT-PCR). All the influenza-negative ILIs had their study identification numbers (IDs) entered in a Microsoft Excel Spreadsheet. By using the randomization syntax in Excel, the existing IDs were assigned new randomization numbers and sorted in a descending order any time new controls were added. The first 2 upper controls were then selected in relation to an influenza-positive ILI (case-patient).

All residents of SO and NP Districts attending selected health facilities who met the case definition for ILI were illegible for inclusion. Those excluded were the non-residents and those who didnot agree to participate in the study.

Data Collection Techniques

A questionnaire was administered by trained research assistants/interviewers who had experience in interacting with the indigenous population attending health facilities. The interview was done in the language the respondent was most comfortable with.

Collection and Investigation of Laboratory Samples

Oropharyngeal and nasal swabs were collected from ILI patients who met the inclusion criteria as specified by an existing protocol under the Epidemiology, Prevention and Treatment of Influenza and other Respiratory Infections Project of NMIMR (Ref.).

The swabs were placed immediately in viral transport medium and temporarily stored at a temperature ranging $+2^0$C to $+8^0$C or liquid nitrogen tanks in situations where samples were to be kept on site for more than 2 days.

Specimens were collected an average of 2 to 3 times weekly and sent to the National Influenza Center (NIC) located in NMIMR which is a biosafety level-3 facility. At the NIC, specimens were kept in liquid nitrogen tanks until they were ready for investigations via real-time reverse transcription PCR (rRT-PCR). Viral RNA was extracted from 200 µl of VTM using an RNeasy Mini kit (Qiagen, Dusseldorf, Germany) per the manufacture's protocol. The RNA from each sample was tested for specific primers and probes.

All ILI samples were first tested for Influenza A and B. Then testing was done for influenza subtypes A(H1N1)pdm09, A(H3N2), seasonal A(H1N1). All influenza B positives were also tested to determine lineage, that is, Influenza B Yamagata and B Victoria.

Data Processing and Analysis

Data were collected at the OPDwithin the period ofApril to November 2016. The completed questionnaires were entered into a database program (Epi-Info version 7) where personal identifiers were coded before entries made. Data was analyzed by the use of Epi-Info 7/ Stata 14.2 software.

The logistic command was initially used for a crude analysis in relation to Influenza-positive ILI case-patients.Using the Shapiro-Wilk test for normal data, all the continuous variables were tested and none had a normal distribution, therefore the median was reported.

The Chi-square test or the Fisher's exact test was used as appropriate on categorical data to test for associations of risk factors with influenza-positive ILI. A test of $p<0.05$ was considered as statistically significant. Odds Ratio was used to measure the strength of association between the exposure variable and the outcome variable. The effect of potential confounders such as age, sex, number in household, Body Mass Index (BMI), second-hand smoke and Wealth Index were assessed [16,17,18] through multiple logistic regression modelling.

Multivariate Analysis

Clinical and statistical significance were some key considerations made in keeping a variable in the logistic regression model with the use of Purposeful Selection approach, using STATA version 14.2 Software.

The purposeful selection approach began by a crude analysis of each independent variable. Any variable that had a significant crude analysis test at an arbitrary level of $p< .20$ was included in the multivariate analysis. In this iterative process of variable selection, covariates were removed from the model if they were non-significant and not a confounder. Significance of the multivariate analysis was evaluated at the 0.10 alpha level and confounding as a change in any remaining parameter estimate greater than 20% as compared to the full model. A change in parameter estimate above 20% indicated the excluded variable was important in the sense of adjusting one or more of the variables remaining in the model. At the end of this iterative process, the model contained significant covariates and confounders. At this point all the variables that earlier on failed to meet the criteria of selection for the initial model were added back one at a time, with significant covariates and confounders retained earlier. Any that were significant at 0.10 level were put back into the model and iteratively reduced as before but only for the variables that were additionally added. At the end of this final step, the main effects model remained [19].

A goodness-of-fit test was performed to assess whether the fitted test was okay for inferential purposes.

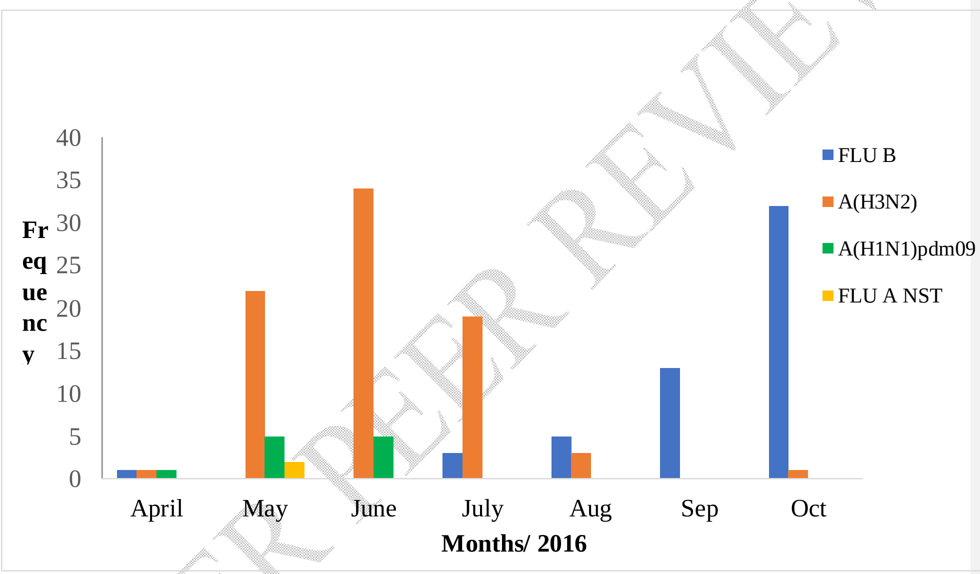
3. RESULTS AND DISCUSSIONS

Background and Individual Risk Factors of ILI Patients

Eight health facilities with relatively high OPD attendance were the study sites. Out of a total 85,663 OPD attendancesfrom the participating health facilities in the SO and NP Districts, 32,942 (38.4%) were residents.

Unlike many other studies, this study sought to establish the risk factors associated with influenza infection in a whole population and not restricted to only children under 5 years. A similar design was used by Peng, Xu, et al.(2015) [20].

Influenza virus type A(H3N2) appeared to be the predominant strain from April to August, 2016. This was replaced by Influenza Virus Type B from August to October, 2016 (Fig.2.0).These findings corroborated Ntiri et al. (2016) as the two viruses mainly in circulation in the area.



Flu B – Influenza B, Flu A NST – Influenza A Non Sub-typable

Fig.2. Monthly Distribution of Confirmed Influenza Types among ILI case-patients

This study had 147 (32.8%) out of 448 ILIs tested being positive for influenza.

The median age of cases and controls was 9 years (IQR: 3 -24 years) and 7 years (IQR: 2 – 36 years) respectively.

The median axillary temperature of ILI positive cases was 0.6^0C higher (*P*<.001) than that of the ILI negative controls.

The independent variables of Smoke, BMI and Exposure to Smoke, presence of existing medical conditions were independently not associated with an Influenza-positive ILI at *P*=.05 significance level.

The odds of females being infected with influenza was 1.13 (95%CI: 0.74 – 1.72) times more as compared with males. The WHO standard age groupings (< 5 years, 5 to <15 years, 15 to < 30 years, 30 to < 45 years, 45 to < 60 years, ≥60 years) was used with 60 years or more as the base group. The highest proportion of participants belonged to the age group of less than 5 years. Fifty-two case-patients (35.4%, *P*= .03) were below 5 years of age. Children less than 5 years also had odds of 3.25 times more to have an influenza positive infection as compared with the base age group of ≥ 60 years (Table 1). This was similar to other studies conducted by Cheng et al (2017) [21], but deaths are known to occur more in the older age groups [22]. This study however did not document any mortality associated with influenza infection.

The highest odds ratio (OR:7.8; 95% CI: 2.52-24.12, *P*< .0001) was identified in the 5 to 14-year group. When the age group was adjusted by sex (female as base), the 5 to 14-year group had an odds ratio of 2.3 (95% CI: 1.36 – 4.15, *P*<.001).

Unlike other studies [23,24], Smoking or Exposure to secondary smoke was independently not associated (OR: 0.60; CI:0.10 – 2.38) with a positive influenza infection.

Influenza is characterized by sudden onset of fever, dry cough, myalgia, headache, sore throat amongst others [25]. Chills was the only sign associated with an influenza-positive ILI with 60.9% vs 50.3% (*P*= .04) in case-patients and their controls respectively. However, with a crude OR= 1.54 (95%CI: 1.00 – 2.35), the lower limit was 1.00 and therefore has to be interpreted with caution. In a study by Yang et al (2015) to look at predictive signs and symptoms of influenza, Chills was not statistically significantly (OR:1.73; 95%CI: 0.89–3.33), *P*= .10 [3].

Fever and cough were omitted from the independent variables due to it being part of inclusion criteria for both the ILI positive cases and ILI negative controls.
No significant relationship was observed with pre-existing medical conditions in this study.

Socio-economic risk factors relating to Influenza positive ILIs

Only occupational status out of the socio-economic variables considered was significant at *P*< .01 (F) with a wide confidence interval at the crude analysis phase. Students formed the highest proportion (28.3%) of case-patients and 30.5% of controls, followed by artisans who were 26.9% among the case-patients, compared with 4.2% in the control group. In China, out of a total of 659,067 influenza cases from year 2008 to 2012, students were the dominant group [26]. The artisan group in this study were 6.24 times more likely to be influenza positive than the controls using unemployed category as the base group. Lietz et al. (2016) on the other hand demonstrated health care personnel to be at most risk [27]

The majority of respondents for cases (77.5%) and controls (74.8%) responded “Don’t know”when asked about the cause of ILI. Similarly, for observations made with the perception of causes and prevention, about 78% of either the case group or the controls mentioned “Don’t know”.

The Wealth Index did not show any significant association with influenza infection, which was quite similar with Doshi et al. (2015) who evaluated the wealth tertile in a study in Bangladesh[28].

Environmental risk factors relating to Influenza positive ILIs

The elements of weather have been detected to play varying roles in respiratory diseases at different geographical settings. For this study, only the onset of illness during June to August (wet season) (OR: 0.62, 95% CI: 0.41 – 0.95), and 3 or more persons sleeping in a room (overcrowding) (OR: 1.71, 95% CI: 1.09 – 2.72) were significantly associated (crude analysis) with an influenza positive infection (Table 1).

The onset of signs and symptoms in the Wet Season for this study appeared to be protective, an indication that influenza infections were more likely to occur in the dry season. This finding should not be considered alone but as a proxy since wet seasons have links with temperature and humidity and not precipitation alone [29].

The household provides defined spaces for contact. Sleeping in a room of 3 or more persons was found to be significantly associated with influenza infection (OR= 1.71; 95%CI;1.09 – 2.72) where 72.7% of case-patients slept in rooms of 3 or more persons vs 60.8% for controls in the crude analysis.

Available literature suggests different routes of transmission (contact, aerosol and droplet) are important and their relative significance will depend on the set of circumstances acting at a given time. Underpinning the process are factors related to the virus itself, the host and the environment[30].The ease of such transmissions position respiratory infections as very challenging outbreaks to manage.

The other environmental variables of domestic fuels (Firewood, Kerosene, Charcoal, LPG), Exposure to secondary smoke and Travel history were independently not associated with influenza positive infection in this study.

Adjusted Logistic Regression for Risk Factors of ILI

After adjusting for covariates and confounders in the multivariate regression, history of recent travel (OR:3.05, 95%CI: 1.07 – 8.73) and chills (OR: 4.57, 95%CI: 1.51 – 13.76) were significant predictors or risk factors of influenza-positive ILIs at $P < .05$ in the presence of other covariates (Table 1.0).

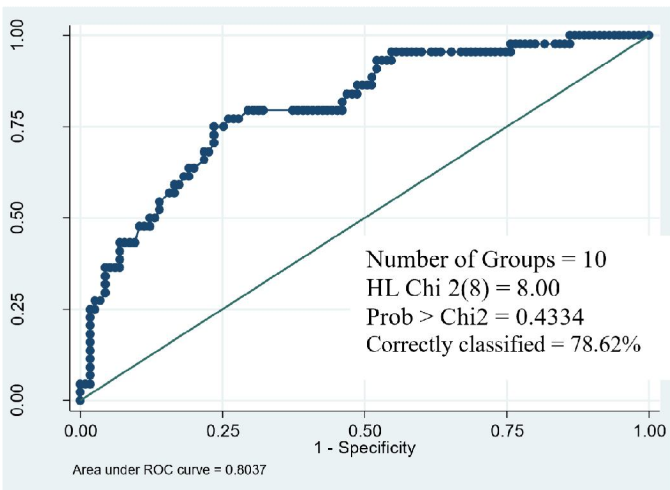
With fever being a cardinal sign for ILI, it wasless surprising chills was associated with a positive influenza virus infection.

In a study in the UK by Adler *et al.* (2014), public transport was not associated with an increased risk of influenza-like disease [31]. However, during the 2008/09 influenza season, recent bus or tram use within five days of symptom onset was associated with an almost six-fold increased risk of reporting a respiratory condition (adjusted OR = 5.94 95% CI 1.33-26.5). These findings have implications for informing the index of suspicion and the control of acute respiratory infectionsdue to Influenza [18].

Table 1. Association of Individual background risk factors with Influenza Positive ILI Case Patients and Controls

Risk Factors	Cases, n(%)	Control, n(%)	Total, N (%)	*OR (95% C.I.)*	*P*-Value	*aOR*	*aOR - P* Value
Sex							
Female	81 (55.1)	171 (67.41)	252 (57.1)	1.00			
Male	66 (44.9)	123 (32.59)	189 (42.9)	1.13 (0.74 – 1.72)	*P*=.54	-	-
Age							
< 5	52 (35.37)	128 (43.5)	180 (40.82)	**3.25 (1.09 – 9.64)**	***P*=.03**	**-**	**-**
5 to <15	39 (26.53)	40 (13.61)	79 (17.91)	**7.80 (2.52 – 24.12)**	***P*<.0001**	**-**	**-**
15 to <30	25 (17.01)	40 (13.61)	65 (14.74)	**5.00 (1.57 – 15.84)**	***P*<.001**	2.81 (0.57 – 13.71)	*P* =.20
30 to <45	15 (10.20)	24 (8.16)	39 (8.84)	**5.00 (1.47 – 16.99)**	***P*=.01**	5.26 (0.99 –27.92)	*P* =.28
45 to <60	12 (8.16)	30 (10.20)	42 (9.52)	3.2 (0.92 – 11.01)	*P*=.06	2.53 (0.51 – 12.59)	*P* =.25
>= 60	4 (2.72)	32 (10.88)	36 (8.16)	1.00		1.00	
Smoker							
No	140 (97.90)	280 (96.55)	420 (97.00)	1.00			
Yes	3 (2.10)	10 (3.45)	13 (3.00)	0.60 (0.10 – 2.38)	*P*=.56	-	-
Chills							
No	57 (39.04)	145 (49.66)	202 (46.12)	**1.00**			
Yes	89 (60.96)	147 (50.34)	236 (53.88)	**1.54 (1.00 – 2.35)**	***P*=.04**	**4.57 (1.51 – 13.76)**	**P<.001**
Travelled						0.69 (0.29 – 1.61)	*P*=.39
No	125 (87.4)	255 (88.2)	380 (88.0)	1.00			
Yes	18 (12.6)	34 (11.8)	52 (12.0)	1.08 (0.55 – 2.05)	*P*=.81	**3.05 (1.07 – 8.73)**	***P*=.04**
≥ 3 Sleep in Room							
No	40 (27.21)	115 (39.12)	155 (35.15)				
Yes	107 (72.79)	179 (60.88)	286 (64.85)	**1.71 (1.09 – 2.72)**	***P*=.01**	-	-

The final model was predictive of an influenza-positive ILI patient with a Goodness-of-fit test. The area under the Receiver Operating Characteristics curve (ROC curve) was 0.8037 and can be described as good in separating the Influenza-positive ILIs and Influenza negative ILIs based on the independent variables of Age, Educational Status, Runny Nose, Onset in Wet Season, CHD and Occupation in the final model (Fig.3.0).



Observations = 159, (ROC Area: 0.8037; 95% CI: 0.728, 0.879)
The test had a high specificity of 92.17%, Sensitivity of 43.18%, PPV = 67.86% and NPV = 80.92%

Fig. 3.0: Goodness of fit test (ROC Curve) for Influenza Positive ILIs

Limitations

The period between exposure to risk factors and reporting with illness could result in recall bias among study participants. Patients who reported on weekends were not recruited as those were non-working days for the field team monitoring the study sites. Nevertheless, those recruited were still representative of the study population considering the design of the study.

4.0 CONCLUSION

This study documented the risk factors associated with Influenza-positive ILIs in the study population. Patients meeting the criteria for an ILI infection and presenting with Chills with a recent history of travel outside the study area were identified as most at risk.This should aid clinicians in increasing their index of suspicion for influenza disease. Communication of the significant risk factors identified in the study to all health workers should be prioritized as an action. The early detection of influenza cases and appropriate health interventions will reduce the public health burden of the disease.

The findings will contribute to knowledge available on the development of a suitable influenza immunization policy in Ghana which will also be beneficial to COVID-19 vaccinations and respiratory diseases in general.

DISCLAIMER

The results and conclusions expressed in this manuscript are entirely those of the authors and do not necessarily reflect the views or positions of the United States Centers for Disease Control and Prevention or any institution the authors represent.

CONSENT

A consent form was administered to each participant. Although there was no known risk associated with the research protocol, notwithstanding, participants were informed of their rights to opt out if they felt uneasy or uncomfortable without any penalty. Giving consent to participate in this study was absolutely voluntary and not under any coercion or obligation. If a participant was below 18 years, the parents or guardians gave their consent. In this instance, children aged 12 to 17 years were asked to provide assent as well. Parents or guardians were asked to provide needed responses on behalf of children less than 12 years.

ETHICAL APPROVAL

This proposal was submitted to the Institutional Review Board of the Noguchi Memorial Institute for Medical Research. It was approved with the number NMIMR-IRB CPN 084/15-16.

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APPENDIX I: ETHICAL CLEARANCE FROM NOGUCHI IRB

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH

Established 1979A Constituent of the College of Health Sciences

University of Ghana

INSTITUTIONAL REVIEW BOARD

Phone: +233-302-916438 (Direct)
+233-289-522574
Fax: +233-302-502182/513202
E-mail: nirb@noguchi.ug.edu.gh
Telex No: 2556 UGL GH

Post Office Box LG 581
Legon, Accra
Ghana

My Ref. No: DF.22
Your Ref. No:

8th March, 2017

ETHICAL CLEARANCE

FEDERALWIDE ASSURANCE FWA 00001824 **IRB 00001276**

NMIMR-IRB CPN 084/15-16 *amend. 2017* **IORG 0000908**

On 8th March, 2017 the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB) at a full board meeting conducted continuing review and amended your protocol titled:

TITLE OF PROTOCOL : **Risk Factors for Acute Respiratory Infections in Shai-Osudoku and Ningo-Prampram Districts**

PRINCIPAL INVESTIGATOR : **Michael Jeroen Adjabeng**

Please note that a final review report must be submitted to the Board at the completion of the study. Your research records may be audited at any time during or after the implementation.

Any modification of this research project must be submitted to the IRB for review and approval prior to implementation.

Please report all serious adverse events related to this study to NMIMR-IRB within seven days verbally and fourteen days in writing.

This certificate is valid till 7th March, 2018. You are to submit annual reports for continuing review.

Signature of Chair: ....

Mrs. Chris Dadzie
(NMIMR – IRB, Chair)