



## UNDERSTANDING DRIVERS OF POULTRY FARMING ON THE USE OF PPE AND THE RISK ASSOCIATED WITH RESPIRATORY TRACT INFECTION IN PLATEAU STATE

<sup>1</sup>Dabo, D. and <sup>2</sup>Azi, E. J.

<sup>1</sup> Department of Community Health, Christian Institute College of Health Science and Technology, Jos Plateau State Nigeria.

<sup>2</sup> Department of Public Health, Faculty of Health Sciences, Plateau State University, Bokoos, Plateau State Nigeria.

Correspondent author: Dabo Daniel, [dabodaniel@yahoo.com](mailto:dabodaniel@yahoo.com), +2348036229305

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### ABSTRACT

*Poultry farming serves as a source of income and livelihood for small-scale farmers particularly women and the youth, contributing to poverty reduction and economic empowerment. It provides and contribute to food and nutrition security, as poultry products are a valuable source of animal protein and essential micronutrients and serve as a livelihood of many resource-poor farmers often being the only asset they possess. Poultry farming is combated with several diseases, including respiratory infectious diseases, which slow down production and affect negatively poultry welfare and productivity. The use of personal protective equipment PPE as a preventive measure against workplace hazards among poultry workers is important and suitable sufficient personal protection, hence, a need for this study. The most occupationally related health problems widely reported among poultry farm workers are respiratory tract problem ranging from asthma, pneumonia, bronchitis and avian influenza. The study aim at understanding drivers of poultry farming on the use of PPE and the risk associated with respiratory tract infection in plateau state. The study design used was a cross sectional descriptive survey. A total of 150 farmers were randomly selected from 6 poultry farms in Plateau State. Data was collected using questionnaires distributed and a multistage sampling technique was used to select respondents. Data was analyzed using statistical package for social science (SPSS) version 27.0 which shows that majority of the respondents were males (70%) and (87.5%) were indigene. Educational attainment of the respondents ranged from secondary education (55%) to non-formal education (2.5%). 55% of the respondents spend 6 hours at their workplace; with 10% working in the poultry industry for more than 15 years. 87.5% of the respondents were aware of respiratory health problems associated with poultry farming; 75% indicated awareness of the use of Personal Protective Equipment while at work. In conclusion, respiratory symptoms such as cough were widely reported by poultry farm workers. Use of PPE was low and duration of work years had a significant influence on the respiratory symptoms. The results emphasized the need for increased investment in the provision and enforcement of internationally recommended personal protective equipment (PPE), including comfortable nose and face masks, protective goggles, hand gloves, and overalls. Such measures would help reduce the burden of respiratory diseases among poultry workers. Furthermore, strengthening occupational health laws is essential to ensure collaboration between healthcare and agricultural workers for the early identification and prompt reporting of respiratory symptoms, enabling timely intervention.*

**Keywords:** drivers, poultry, farming, PPE, respiratory, infection.

### INTRUDUCTION

Poultry farming is seen as a lucrative business with multi-dimensional benefits not only to the aspect of meat and egg use for proteins food, but the dung is also used as a manure for crops and plants and it is also used as feed for other animals such as pigs. Increasing demand of poultry product in the market stimulates many people to venture into the business. Grace et al (2024) stated that poultry farming serves as a source of income and livelihood for small-scale farmers, particularly women and the youth, contributing to poverty reduction and economic empowerment. It contributes to food and nutrition security, as poultry products are a valuable source of animal protein and essential micronutrients. Additionally, smallholder poultry farming is often more environmentally sustainable compared to larger commercial operations as it utilizes local resources, requires less infrastructure, has a lower carbon footprint, and indigenous poultry breeds are more resilient to extreme weather events (Wong et al., 2017). The poultry sector is possibly the fastest growing and most flexible of all livestock sectors. Driven primarily by very strong demand it has expanded, consolidated and globalized over the past 15 years in countries of all income levels. Livestock is fundamental to the livelihoods of about one billion of the world's poorest people. Rural poultry, in particular, is essential for the livelihood of many resource-poor farmers often being the only asset they possess. Researchers have reported that poultry farming is combated with several diseases, including respiratory infectious diseases, which slow down production (Jones, 2010). Although respiratory infections impact negatively poultry welfare and productivity, they are largely not very much studied in most African countries (Owoade et al., 2006).

Village poultry production contributes to:

- i. improving human nutrition by providing eggs and meat rich in micronutrients;
- ii. generating small income and savings, especially for women, thereby reducing economic vulnerability;
- iii. providing manure for vegetable gardens and crops.

The socio-cultural and religious significance of village poultry for smallholder livelihoods is also widely recognized.

According to Pagni et al (2008) poultry farm workers carry out tasks such as feeding of birds, collection of eggs, laying down beddings/litter, cleaning and populating poultry houses, handling and inspection of birds, removal of litter/manure, fumigation of poultry houses amongst others. The most occupationally related health problems widely reported among poultry farm workers are respiratory health problems ranging from asthma, pneumonia, bronchitis and avian influenza (Hamid et al., 2018; Ven et al., 2018) with symptoms such as cough, wheeze and phlegm production widely reported (Hamid et al., 2018). Jerez et al., (2014) added that these are mainly attributed to the inhalation of and interaction with respiratory irritants by poultry workers in poultry farm settings as they spend considerably long periods of time in the poultry farm, exposed to these hazards, hence a need for this study. International Labor Organization (2011) revealed that the use of personal protective equipment as a preventive measure against workplace hazards among poultry workers is important; and suitable and sufficient personal protective equipment with regards to the type of work and risk involved should be used by workers and provided by employers. According to the European Commission (2012), personal protective equipment used in agricultural settings include gloves, boots, goggles, mouth/nose masks, breathing apparatus, hardhats and protective clothing. In developing countries, informal sectors are not yet properly covered by safety and health legislation as poultry workers rarely use personal protective equipment while exposed to high levels of respiratory irritants which contribute to respiratory health issues (Adebowale & Adeyemo, 2016). This study was conducted to understand

drivers of poultry farming on the use of personal protective equipment and the risk associated with respiratory tract infection in plateau state. It is envisaged that the results of this study will add to the body of knowledge on the respiratory health of poultry workers and provide data for health, agriculture and labor agencies for the advocacy on the use of personal protective equipment in the poultry industry. Kearney et al (2015) noted that personal protective equipment has a definite role in the prevention and reduction of the myriad of health hazards (diseases) that poultry workers are frequently exposed to at work.

Discussing respiratory infection, Viegas et al (2013) explained that poultry farmers are occupationally exposed to many respiratory hazards at work and display higher rates of asthma and respiratory symptoms than other workers. Dust is one of the components present in poultry production that increases risk of adverse respiratory disease occurrence. They stated further that dust originates from poultry residues, molds, and feathers and is biologically active as it contains microorganisms. Exposure to dust is known to produce a variety of clinical responses, including asthma, chronic bronchitis, chronic airways obstructive disease (COPD), allergic alveolitis, and organic dust toxic syndrome (ODTS). Respiratory syndromes (RS) are a significant concern in poultry farming, arising from complex interactions between pathogens and environmental factors. Breathing difficulties due to respiratory diseases are a leading cause of mortality in poultry farming (Birring et al., 2004).

## **METHODOLOGY**

### **Study Area**

This study was conducted among the poultry farmers in Plateau State. Plateau State shares boundaries with Bauchi State to the Northeast, Kaduna State to the Northwest, Nasarawa State to the Southwest, and Taraba State to the Southeast (NIPC, 2022). The State has an estimated population of over 3,000,000 people and covers an area of 26,899 square kilometers located in the tropics, but its higher altitude gives it a cooler climate, with average temperatures ranging from 18 to 22°C (Federal Republic of Nigeria Official Gazette 2009). Plateau State is situated approximately on latitude 8°24'N and longitude 8°03' and 10°38'E with a more temperate climate than the rest of Nigeria (Amusuk et al., 2016). Because of the clement weather, Plateau State is very suitable for poultry production and other livestock farming activities. The State is also a major hub of poultry farming in Northern Nigeria supplying day-old chicks (DOC) and other poultry products to several northern Nigerian States and Abuja, the Federal Capital territory of Nigeria. The State relies on trading, hunting, farming (poultry, pig, cattle and goat) as one of its sources of income and protein. Study locations of poultry farms and farmers where the study was carried out in Plateau State poultry production system in the study area consists of mostly smallholder backyards and some commercial farms with a population range of 50-50,000 chickens per farm primarily for egg production and supported by seasonal broiler production.

### **Study Population and Ethical Approval**

A total of 150 farmers were randomly selected from 66 registered poultry farms in Plateau State. Prior to the conduct of the study, ethical approval was obtained from Ethics and Research Committee, Ministry of Health, Plateau State, and informed Participation consent of workers was voluntary. An introduction letter was given to the managers/directors of the selected poultry farms before workers were interviewed. Informed consent was also obtained from each participant prior to the interview

### **Study Population and Design**

The study is a cross sectional descriptive study design. The respondents comprised of poultry workers who have been in workers at the farm for at least 5 months preceding the study. Sample size was calculated using the formulae for determining the sample size for infinite population since the exact number of poultry workers in Plateau State is unknown; with sample size of 150 generated. Thus sample. The sample formula is thus stated as;

$$\frac{Z^2 * p (1-P)}{n = a^2}$$

Where; Z= 1.96 (at 95% confidence interval and ±5% precision) p = proportion /best guess of value of proportion of population that are poultry workers d = tolerance (how close the proportion of interest is to the desired estimate)

Thus;

$$\frac{(1.96)^2 * 0.5 (1-0.5)}{n = 0.05^2} = 150 \text{ poultry workers.}$$

### Sampling Method

A multistage sampling technique was used to select respondents. In the first stage, six local government areas in the state were selected randomly namely Jos North, Jos South, Jos East, Mangu, Bokkos and Sandam LGAs. In the second stage, purposive sampling was employed to select 66 commercial poultry farms registered from each of the selected LGA. List of registered commercial poultry farms was provided by State Ministry of Agriculture and natural resources. Thus, in each of the selected local governments, eleven commercial poultry farms were randomly selected to give a total of 66 farms. In the third stage, at each selected farms, random sampling was employed to select 2 each and 3 from large 9 farms in Jos south and Jos north LGAs, giving a total of 150 participants.

### Data Collection Technique

Data was collected using questionnaires distributed and collected by the assistant of agricultural extension workers of the Agric Department in the study LGAs Jos south, Jos north, Jos east, Mangu, Bokkos and Shandam who were more familiar with the content of the questionnaire, manner of approach and location of the poultry farm selected. In cases where a respondent were unable to fill the questionnaire due to low literacy, the questions were translated and asked in local language and answers were recorded as given.

### Data Analysis

Data was analyzed using statistical package for social science (SPSS) version 27.0.

**Table. 1. Socio-demographic characteristics of the respondents.**

Scio-demographic Characteristics	Study population (N= 400)	
	Frequency	Percentage (%)
Age :		
16- 20 years	15	3.75
21-25 years	40	10
26- 30 years	30	7.5
31-35 years	140	35
36- 40 years	100	25
41- 45 years	70	17.5
50 years above	5	1.25
Sex:		
Male	280	70
Female	120	30
Duration of work years:		
15 years	20	5
<1years	200	50
1-4years	100	25
5-9years	40	10
10>	40	10

Level of education:		
No education	10	2.5
Primary education	30	7.5
Secondary education	220	55
Tertiary education	140	35
Number of hours spent at workplace:		
1 hour	10	2.5
3 hours	140	35
6 hours	220	55
12 hours	30	7.5
Ethnic group:		
Plateau indigene	350	87.5
Non indigene	40	10
Others	10	2.5

This is socio-demographic table showing respondents age, sex, work duration education attainment, hours of work and ethnic identity portrayed their frequency and percentages.

### Results

A total of 150 poultry workers were interviewed. Socio demographic characteristics of the poultry farm workers showed the mean age of respondents was 34.3 (SD  $\pm$  6.785) years with the highest age range at 31-35 years. Majority of the respondents were males (70%) and of the indigene group (87.5%). Educational attainment of the respondents ranged from secondary education (55%) to non-formal education (2.5%). 55% of the respondents spend 6 hours at their workplace; with 10% of the respondents working in the poultry industry for more than 15 years (Table 1).87.5% of the respondents were aware of respiratory health problems associated with poultry farming (Figure 1); with 75% of the respondents indicating awareness of the use of Personal Protective Equipment while at work (Figure 2).

Table 2. Relationship between respiratory symptoms and duration of work years using Chi Square test

Respiratory symptoms	Work duration (years)										Test	P-value
	Less than 1yr		1-14 yrs		5-9yrs		10-14		15>yrs			
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Cough	18	2	200	0	92	80	0	40	40	0	316.25	.0000
Phlegm production	20	0	200	0	40	60	0	40	0	40	294.50	.0000
Breathlessness	18	2	202	98	0	100	0	40	0	40	153.42	.0000
Wheeze	18	2	212	88	0	100	0	40	0	40	167.15	.0000
Chest tightness	18	2	202	98	0	100	0	40	0	40	153.42	.0000
Chest pain	18	2	202	98	0	100	0	40	0	40	153.42	.0000

The relationship of work time and respiratory infection symptoms is displayed on this table. It shows how long farmers have been working which may likely have exposed them to respiratory diseases based on age category. A chi square test further analysis their responses with result as stated.

Figure 1. Awareness on use of PPE at workplace

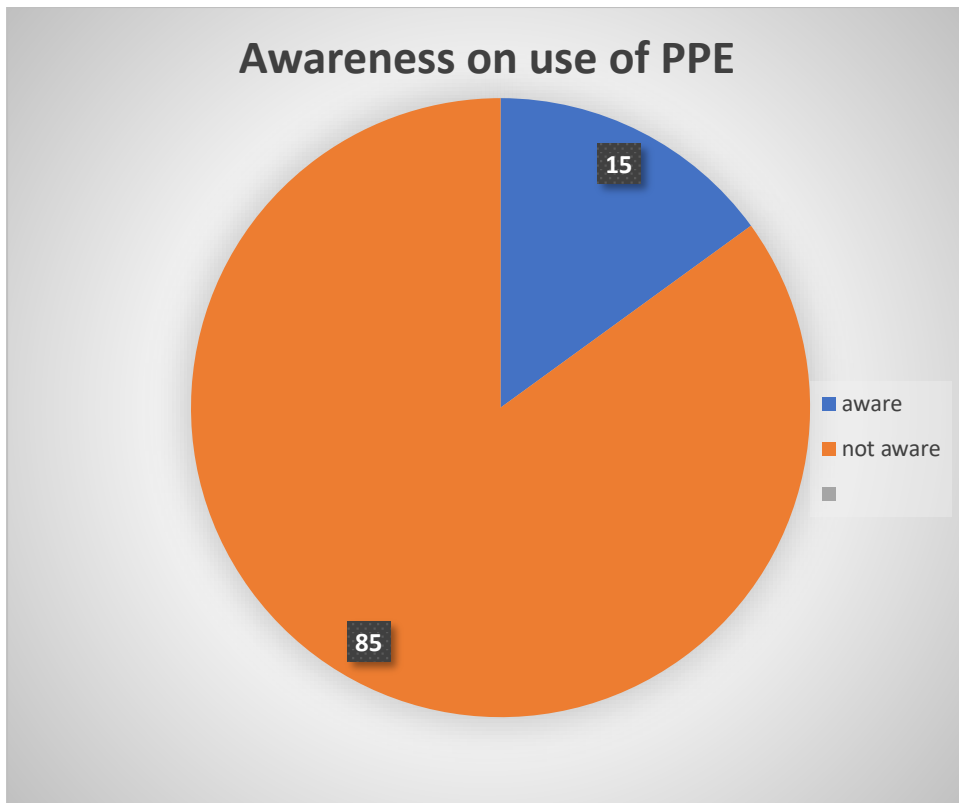
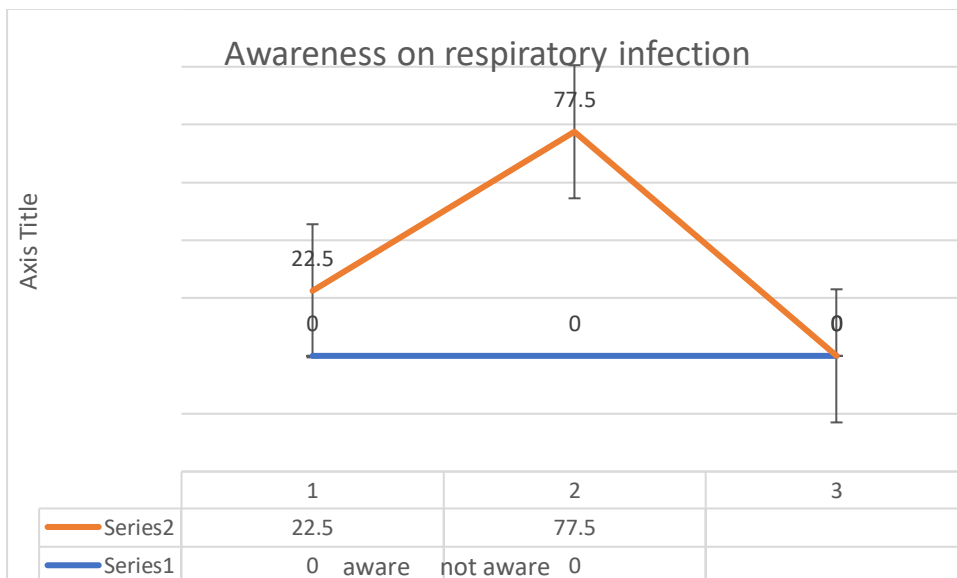


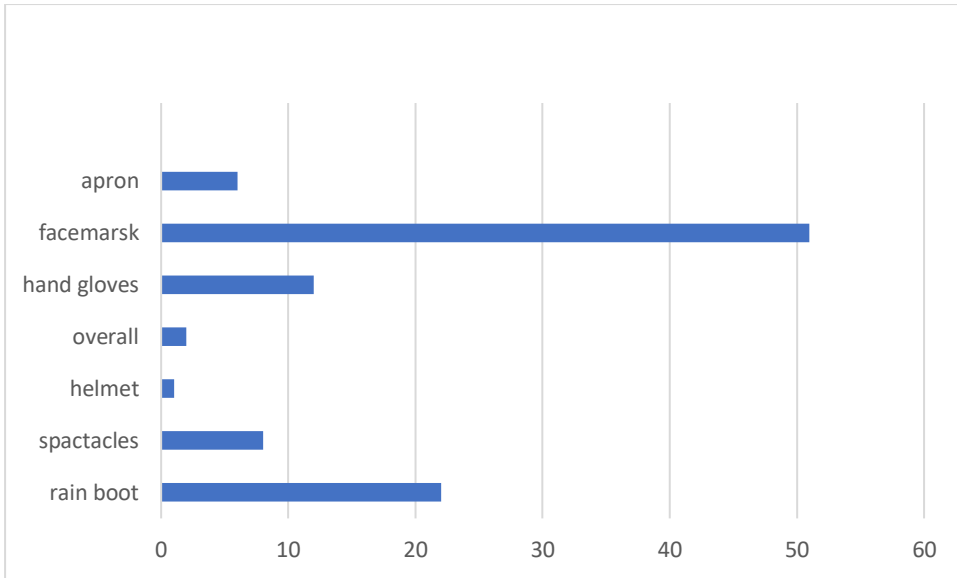
Figure indicated level of awareness of poultry workers to use PPE whenever they are working in the farm. High number showed ignorant of use of PPE.

Figure 2. Awareness of respiratory infection associated with poultry farming



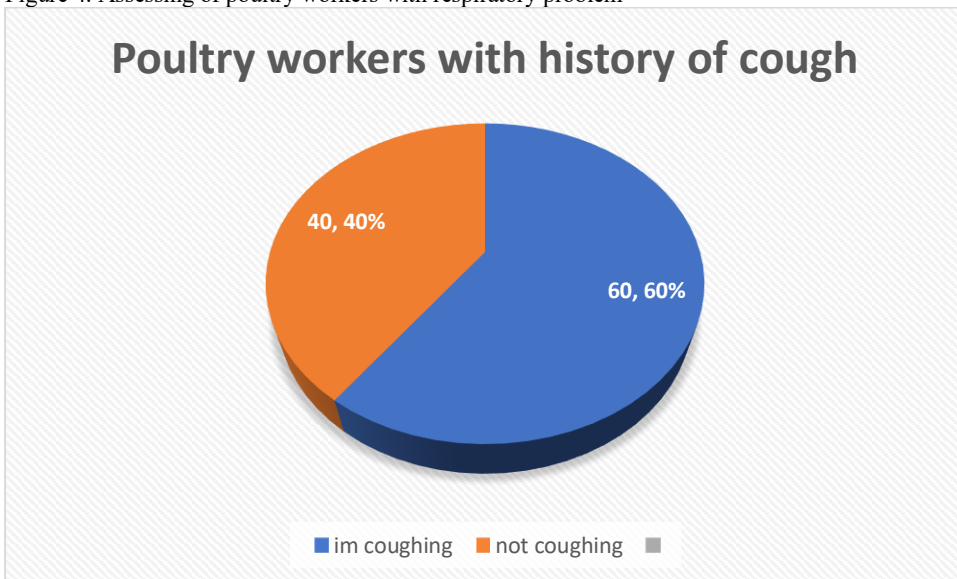
This figure analysis awareness of respiratory infection associated with poultry workers. 77.5 are not aware of the associated infection while only 22.5 show they are aware.

Figure 3. Level of used of PPE among poultry workers



This Figure shows that 52% poultry farmers used face mask more frequently when working in the poultry farm. 23% used rain boot, and only 1% used helmet.

Figure 4. Assessing of poultry workers with respiratory problem



The above figure indicated 40.4% of respondents are having respiratory infection (cough) while 60. 6% are not coughing.

**Discussion**

PPE used among the respondents was represented in Figure 3 with facemask (52%) being the most used PPE.

Self-reported respiratory symptoms (cough) among the respondents represented in Figure 4 with 60% are coughing while 40% without cough respectively. In this study, male workers outnumbered the female workers and this finding is consistent with previous studies that attributed the hiring of male workers in poultry farms (Viegas et al., 2013). Majority of poultry workers were 31-35 years old ( $34 \pm 6.785$ ) with 1.25% of the workers above 50 years. The healthy workers effect may be a reason for this result; as employers do not reject certain persons due to physical disabilities or poor general health (healthy hire effect); or workers who do not have strong motivation to work because of health problems do not present themselves for employment or retire early (healthy worker survivor effect) (Chowdhury et al., 2017). Respondents were predominantly indigenous ethnic group of Plateau and this is attributed to the fact that the study location is also in Plateau state Nigeria whose people are predominantly. Level of education ranged from secondary education (55%) to no formal education (2.5%) with majority of the respondents working in the industry for 1-15 years.

In their view, Kearney et al., (2015) asserted that personal protective equipment has a definite role in the prevention and reduction of the diverse health hazards (diseases) that poultry workers are exposed to at work. The poultry workers should use appropriate PPE for prevention of work related respiratory diseases. In this study, 85% of the poultry workers reported they were aware of the use of PPE at work. A similar study comparing the use of PPE among workers revealed 1% use of PPE among Thai workers; and 26% use of nose mask and 51% use of gloves among Minnesota poultry farmers (Odo et al, 2015). Also a study on the use of PPE among poultry workers in England stood at protective coverall 81%, protective footwear 82%, disposable gloves 67%, facemask 51%, and protective goggles 19% (Morgan et al., 2013). Neupane et al., (2012) conducted a study on Nepal poultry workers on the use of PPE; facemask 27.1%, gloves 30.2%, and boots 7.3% and coverall 3.1%. However in this study, the use of mouth/nose mask was 52%, rain boot 23%, coverall 3%, hand gloves 13%, eye spectacles 8%. Again, in this study, 60% respondents said that they are coughing and 40% indicated that they were not coughing respectively. Similar results have been reported in a study on poultry workers in Ibadan, Nigeria with cough at 49.3%, phlegm at 56% and wheeze at 7.3% (Jaiyesimi & Agbaje (2015). Studies on respiratory symptoms among poultry farmers in France reported cough at 79% and shortness of breath at 21% (Guillam et al., 2013). Cough usually indicates the presence of a disease usually a respiratory tract infection such as common cold, acute bronchitis, pneumonia or tuberculosis; and can be caused by smoking, choking and air pollution (Chung & Pavord, 2008). Ambient air pollution increases the risk of respiratory infections especially pneumonia; as exposure to air pollutants such as particulate matter induces oxidative stress in pulmonary macrophages and epithelial cells. This reduces the lungs defenses against bacterial pathogens and disrupts the composition of the oropharyngeal micro-biota thus increasing the susceptibility to respiratory infections. In this study, more than half of responded poultry farmers were reported with respiratory infection. Studies by El-Saadawy et al., (2011) on poultry farm workers in Sharkia Governorate, Egypt reported bronchitis and asthma at 16.3% and 6.3% respectively. Another study by Hamid, Ahmad, & Khan (2018) on poultry farm workers in Pakistan reported 1.4% asthma cases. The mechanism of occurrence of bronchitis and asthma has been attributed to dust in poultry farms containing inflammatory agents such as allergic fungi which have biologically potent components in the cell wall and cytoplasm (El-Saadawy et al., 2011). In this study, duration of work years had significant influence on respiratory symptoms were it is more pronounced among workers who have been in employed in the poultry farms for 1-6 years.

## **Conclusion**

Respiratory symptoms such as cough were widely reported by poultry farm workers. Use of PPE was low and duration of work years had a significant influence on the respiratory symptoms. Results obtained stressed the need for investment in the provision and enforcement of internationally recommended PPE such as comfortable nose and face masks, protective goggle shield, hand gloves and overall; these help decrease the burden of respiratory diseases among poultry farmworkers. Strengthening occupational health laws and providing modern equipment services in the country is also highly recommended and close collaboration of health care workers with agricultural workers for quick identification and notification of respiratory symptoms and intervention.

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