Knowledge of Avian Influenza Among Poultry Workers & Development of SIM on Prevention of Avian Influenza

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Abstract

Avian influenza is an important zoonotic disease of global concern, with poultry workers at particular risk because of their close and frequent contact with birds and contaminated environments. This study assessed the level of knowledge regarding avian influenza among poultry workers in selected poultry farms of Sangli and Miraj city, with a view to developing a self-instructional module on its prevention. A descriptive cross-sectional design was used, and 60 poultry workers were selected by simple random sampling from identified farms in the study area. Data were collected using a structured questionnaire consisting of demographic variables and 16 multiple-choice items covering transmission, clinical manifestations in humans and birds, diagnosis, vaccination, biosecurity measures, safe cooking practices, and use of personal protective equipment. Knowledge scores were categorized as bad, average, good, or excellent. The findings showed that 70% of poultry workers had average knowledge and 30% had good knowledge; none had bad or excellent knowledge. More than half of the workers reported no prior knowledge of avian influenza, and among those who had heard about it, the main sources were social media, newspapers, television, and health workers. Important gaps were observed in the understanding of human-to-human transmission, recommended personal protective equipment, appropriate cooking practices, reporting of sick or dead birds, and farm-level biosecurity. Chi-square analysis revealed no statistically significant association between knowledge level and selected demographic variables such as age, education, type of work, work experience, and previous knowledge. In response to the identified deficiencies, a self-instructional module was developed focusing on essential concepts and practical preventive measures. The study highlights the need for simple, locally appropriate educational interventions to strengthen knowledge and promote safer practices among poultry workers, thereby reducing the risk of avian influenza transmission at the human–poultry interface.

Keywords: avian influenza; poultry workers; knowledge; biosecurity; self-instructional module

How to cite this article: Dhudum B, Devraj MR, Bergerib AS, Ghorpade VK, Kamble RJ, Kulkarni MS, Babu DM, Londhe S, Thombare V. Knowledge of Avian Influenza Among Poultry Workers & Development of SIM on Prevention of Avian Influenza. Int J Drug Deliv Technol. 2026;16(64s):1504-1510. DOI: 10.25258/ijddt.16.64s.161

Introduction:

Influenza A viruses, particularly avian strains like bird flu, are segmented RNA viruses primarily circulating in wild birds such as waterfowl, with high diversity due to rapid mutation and reassortment. Historical outbreaks, including "fowl plague" since the 1800s, were later identified as highly pathogenic H5 and H7 subtypes causing severe disease in poultry. These viruses have zoonotic potential, sparking pandemics like the 1918 H1N1 Spanish flu and recent H5N1/H7N9 spillovers, spread via migratory birds and poultry trade(Garg et al., 2025; Lycett et al., 2019).

Avian influenza (AI) viruses have been detected frequently since 2022, posing ongoing risks to health, economies, and food security. The last comprehensive global review of AI outbreaks and infections was published nearly a decade ago,

leaving a gap in updated surveillance data. Recent increases in reports of highly pathogenic strains like H5N1, H5N8, and H5N6 in both birds and humans highlight the urgent need for a new global analysis to assess pandemic risks (Eisfeld et al., 2024; Szablewski et al., 2023).

The 2014 avian influenza outbreak in Kerala's Kuttanad region caused severe economic losses to poultry farmers, hatcheries, and tourism operators. Duck farms suffered the highest losses, with commercial farms losing around USD 9,181 per farm, while backyard poultry losses were relatively small. Hatcheries faced significant setbacks, with large ones losing nearly USD 11,963, and the government spent USD 744,890 on disease control measures. The outbreak also disrupted markets, delayed price recovery by eight weeks, and reduced tourist inflow, costing boat operators about USD 2,280 each, highlighting the need for preventive biosecurity and regular screening of domestic birds (Govindaraj et al., 2018; Kang et al., 2024).

Human influenza pandemics occur periodically, often linked to avian influenza spreading among domestic birds. This increases the risk of mutations and genetic reassortment that can trigger new pandemics. Currently, the global alert level for avian influenza is phase 3 on a six-point scale, indicating moderate concern. Preventive vigilance remains essential to reduce future risks(Kumar et al., 2025; Uyeki et al., 2024) .

The focus of the present study was to assess the level of knowledge regarding avian influenza infection among poultry workers and to develop a self-instructional module on the prevention of AI infection among poultry workers.

Materials & Methods:

Ethical Considerations

Institutional Ethics Committee (IEC) approval was obtained from Bharati Vidyapeeth (Deemed to be University) College of Nursing, Sangli. Farm owner permissions, informed written consent (English/Marathi), and confidentiality via code numbers were upheld; data used solely for research. Voluntary participation and the right to withdraw were emphasized.

Research Approach

This study adopted a quantitative research approach to systematically investigate the knowledge levels of poultry workers regarding avian influenza. The approach focused on measurable data collection through structured tools, enabling objective analysis of knowledge gaps and associations with demographic variables. It involved deductive methods to test predefined hypotheses derived from the literature review.

Research Design

A cross-sectional descriptive study design was employed to capture a snapshot of knowledge at a specific point in time among poultry workers in selected farms. This design suited the objective of assessing current knowledge without intervention, using surveys for efficiency in data gathering from the target population.

Setting and Sample size & Sampling technique

The study was conducted in selected poultry farms in Sangli and Miraj city areas, chosen for high poultry worker density and relevance to avian influenza risks. The sample comprised 60 poultry workers, determined using the power analysis. Inclusion criteria encompassed workers willing to participate, literate in English or Marathi, and involved in farm activities; exclusions were non-consenting individuals. Simple random sampling was utilized to select participants, promoting representativeness and minimizing bias in this cross-sectional setup. Workers meeting the criteria were randomly drawn from farm lists provided by owners after permission. This technique supported generalizability within the local context.

Data Collection Tool, Validity, Reliability & Data Analysis

The tool consisted of two sections: Section I for demographic variables (age, gender, education, work type, experience, prior knowledge sources) and Section II, a structured knowledge questionnaire with 16 multiple-choice items across domains like definition, transmission, symptoms, diagnosis, prevention, and treatment. Correct answers scored 1, incorrect 0; levels were poor (0-5), average (6-10), good (11-16), excellent (17+). The questionnaire was developed from the literature review for content relevance. Content validity was established by 14 experts (4 community health, 5 medical-surgical nursing, 1 statistician), whose suggestions refined the tool. The Marathi translation was validated by language experts for cultural and linguistic accuracy. Expert feedback ensured alignment with study objectives and avian influenza knowledge domains. Reliability was tested via split-half method on 10 workers at a Miraj farm on 01/04/2025, yielding a coefficient of 0.95 (>0.7 threshold), confirming high internal consistency. The pilot study on 02/04/2025 (n=10) affirmed feasibility, tool clarity, and no modifications needed. This validated tool readiness for the main data collection. Descriptive statistics (frequency, percentage) described demographics and knowledge levels; inferential chi-square tested associations with variables.

Results:

Table No. 1: Frequency and Percentage Distribution of Demographical Variables.

n= 60

Demographic Variables		Frequency	Percentage
Age (in Yrs.)	21 – 30	16	26.67
	31 – 40	17	28.33
	41 – 50	9	15
	51 – 60	9	15
	61 – 70	7	11.67
	71 – 80	1	1.67
	81 – 90	1	1.67
Gender	Male	60	100
	Female	0	0
Education	No Formal Education	0	0
	Primary Education	50	83.33
	Secondary Education	9	15
	Higher Secondary Education	1	1.67
Type of Work	Feeding	15	25
	Sanitation	17	28.33
	Monitoring	17	28.33
	Egg Collector	11	18.33
Work Experience (in Yrs.)	Less Than 5	22	36.67
	5 to 10	34	56.67
	Greater Than 10	4	6.67
Previous Knowledge Regarding Avian influenza	No	33	55
	Yes	27	45
If Yes (Source of Knowledge)	Social Media	11	18.33
	Tv	2	3.33
	Newspaper	7	11.67
	Health Worker	6	10
	Other	1	1.67

The table no. 1 shows that most workers fall in the age group of 31–40 years (28.33%), followed closely by 21–30 years (26.67%), while very few are above 70 years. All participants are male, with no female representation. In terms of education, the majority (83.33%) have only primary education, and very few (1.67%) have higher secondary education. The main types of work are sanitation and monitoring (each 28.33%), followed by feeding (25%) and egg collection (18.33%). More than half of the workers (56.67%) have 5–10 years of experience, while only 6.67% have more than 10 years. Regarding avian influenza knowledge, 55% had no prior awareness, and among those who did, social media was the most common source (18.33%), followed by newspapers and health workers.

Table No. 2: The level of knowledge regarding avian influenza among poultry workers.

n = 60

Score	Level of Knowledge	Frequency	Percentage
0 – 5	Poor	0	0
6 – 10	Average	42	70
11 – 16	Good	18	30

The table no. 2 indicates that none of the poultry workers scored in the poor knowledge category (0–5). A majority of them, 70%, fall into the average knowledge range (6–10), showing that most workers have only a moderate understanding of avian influenza. Meanwhile, 30% of the workers

demonstrated good knowledge (11–16), reflecting a smaller but significant group with stronger awareness. The absence of poor scores suggests that all workers possess at least some basic knowledge of the disease. Overall, the findings highlight that while awareness exists, most workers remain at an average level of understanding, with room for improvement through targeted education.

Table No. 3: Association between knowledge level and demographic variables.

n = 60

Demographic Variables		Knowledge Level		Chi-Square Test	p-Value	Significance
		Average	Good			
Age (in Yrs.)	21 – 30	12	4	5.983	0.425	Not Significant
	31 – 40	14	3			
	41 – 50	4	5			
	51 – 60	5	4			
	61 – 70	5	2			
	71 – 80	1	0			
	81 – 90	1	0			
Education	No Formal Education	0	0	2.476	0.29	Not Significant
	Primary Education	36	14			
	Secondary Education	6	3			
	Higher Secondary Education	0	1			
Type of Work	Feeding	9	6	1.095	0.778	Not Significant
	Sanitation	12	5			
	Monitoring	13	4			
	Egg Collector	8	3			
Work Experience (in Yrs.)	Less Than 5	17	5	1.406	0.495	Not Significant
	5 to 10	23	11			
	Greater Than 10	2	2			
Previous Knowledge Regarding Avian influenza	No	23	10	0.003	0.995	Not Significant
	Yes	19	8			

The table no. 3 highlights the association between demographic variables and knowledge levels, analyzed through chi-square tests. Age did not show a significant influence, as the chi-square value of 5.983 with p = 0.425 indicates no statistical association between age groups and knowledge levels. Similarly, education was not a determining factor, with chi-square = 2.476 and p = 0.29, suggesting that knowledge levels were fairly consistent across primary, secondary, and higher secondary education. Type of work also had no significant effect, as chi-square = 1.095 and p = 0.778, meaning that feeding, sanitation, monitoring, and egg collection roles had comparable knowledge levels. Work experience showed no significant relationship, with chi-square = 1.406 and p = 0.495, indicating that both less experienced and more experienced workers had similar knowledge. Previous knowledge regarding avian influenza was also not significant, with chi-square = 0.003 and p =

0.995, showing that prior exposure did not enhance knowledge levels. Overall, none of the demographic variables studied reached statistical significance, and knowledge distribution appeared uniform across all categories. This suggests that external factors such as age, education, type of work, work experience, or prior knowledge did not strongly influence knowledge levels in this sample.

Discussion:

The present study assessed the association between demographic variables and knowledge levels of poultry workers regarding avian influenza. The findings revealed that none of the demographic variables—age, education, type of work, work experience, or prior knowledge—showed a statistically significant association with knowledge levels ($p > 0.05$). This suggests that knowledge distribution was relatively uniform across different categories of workers. Similar results were reported in Ghana, where 87.1% of respondents demonstrated poor knowledge of avian influenza despite differences in age and education. In contrast, a study in Indonesia found that 91.3% of poultry workers had good knowledge, largely influenced by health workers and television as major sources of information(Asare et al., 2021).

The lack of significant association in our study may be attributed to limited exposure to structured training and reliance on informal sources of information. In Guinea, knowledge levels were also low (42.9%), with education and occupation significantly influencing awareness. Our results differ from Guinea's findings, as education did not emerge as a significant determinant in this sample. This discrepancy could be due to contextual differences in outreach programs and literacy levels across countries(Diaby et al., 2025).

Age did not significantly influence knowledge in our study, although workers aged 41–50 years showed relatively better knowledge scores. This partially aligns with Ghanaian data, where younger workers (20–39 years) were more likely to be aware of avian influenza. Work experience also showed no significant association, contrasting with Guinea's findings, where longer experience correlated with better practices(Asare et al., 2021).

Interestingly, prior knowledge of avian influenza did not translate into significantly higher knowledge scores in our study. This finding highlights a gap between awareness and actual comprehension, consistent with Ghanaian results, where only 9.29% could correctly define avian influenza as a viral disease. In Indonesia, however, prior exposure through health workers was strongly linked to higher knowledge levels(Asare et al., 2021).

The uniformity of knowledge across demographic groups in our study underscores the need for structured, targeted educational interventions. Mass media such as radio and television were effective in Ghana, while health workers played a crucial role in Indonesia(Rehman et al., 2023). In Guinea, healthcare professionals and employers were key sources of information, yet knowledge remained low. This suggests that the quality and depth of information disseminated may be more important than the source itself(Diaby et al., 2025).

Our findings also emphasize that demographic characteristics alone cannot predict knowledge levels in certain contexts. Instead, systematic training, reinforcement of biosecurity practices, and continuous education campaigns are essential. The absence of significant associations may reflect a general lack of structured awareness programs in the study setting.

Comparatively, countries with stronger veterinary public health systems, such as Indonesia, demonstrate higher knowledge levels among poultry workers. Conversely, in regions with limited outreach, such as Ghana and Guinea, knowledge remains poor despite awareness campaigns. This highlights the importance of integrating avian influenza education into routine extension services and farmer training programs.

The implications of these findings are critical for disease prevention and control. Uniformly low knowledge across demographic groups increases the risk of poor biosecurity practices and potential outbreaks. Educational campaigns should therefore be tailored to all categories of workers, regardless of age, education, or work experience.

In conclusion, our study contributes to the growing body of evidence that poultry workers' knowledge of avian influenza remains inadequate in many developing countries. Unlike Indonesia, where knowledge was high, both Ghana and Guinea reported poor knowledge and practices, consistent with our findings. This underscores the urgent need for comprehensive, context-specific interventions to bridge the gap between awareness and actionable knowledge.

Conclusion

The present study explored the knowledge levels of poultry workers regarding avian influenza. All participants were male, reflecting gender-specific involvement in poultry farming in this setting. Educational attainment was largely limited to primary schooling, with very few having secondary or higher education, which may influence comprehension of technical health information. Most workers were engaged in sanitation and

monitoring tasks, suggesting direct exposure to poultry environments.

Despite nearly half of respondents reporting prior knowledge of avian influenza, the overall understanding remained limited. Social media emerged as the most common source of information, followed by newspapers and health workers, underscoring the role of informal and mass communication channels. Knowledge assessment revealed that 70% of workers had average knowledge, while only 30% demonstrated good knowledge, and none fell into the poor category. This indicates partial awareness but insufficient depth of understanding.

The absence of poor knowledge scores in this study may reflect some baseline awareness, yet the predominance of average knowledge indicates inadequate preparedness for effective disease prevention. Uniform distribution of knowledge across demographic groups suggests that interventions should target all workers equally, rather than focusing on specific categories.

Overall, the study underscores the urgent need for structured, context-specific educational initiatives to improve knowledge and practices regarding avian influenza. Strengthening awareness through health professionals, integrating training into routine farm activities, and leveraging mass media could enhance comprehension. Without such interventions, poultry workers remain vulnerable to misinformation and poor biosecurity practices.

In conclusion, while awareness of avian influenza exists among poultry workers, the depth of knowledge is insufficient, and demographic factors do not significantly influence understanding. Comprehensive educational campaigns, tailored to the realities of poultry farming communities, are essential to bridge this gap. This will not only improve disease prevention and control but also safeguard public health and the poultry industry's sustainability.

References:

Asare, R. B., Folitse, R. D., Burimuah, V., Atawalna, J., Tasiame, W., & Emikpe, B. O. (2021). Knowledge, attitudes and practices relating to avian influenza among poultry workers in Ejisu-Juaben Municipality of Ashanti Region, Ghana. *PAMJ-OH*, *4*(1). https://doi.org/10.11604/pamj-oh.2021.4.1.25797

Diaby, M., Bangoura, S. T., Hounmenou, C. G., Kadio, K. J. J. O., Touré, A. B., Bereté, K., Bongono, E. F., Sidibé, S., Delamou, A., Camara, A., Keita, A. K., & Touré, A. (2025). Exploratory analysis of poultry workers' knowledge and practices Regarding highly pathogenic avian influenza in Guinea. *PLoS ONE*, *20*(3 MARCH). https://doi.org/10.1371/journal.pone.0320890

Eisfeld, A. J., Biswas, A., Guan, L., Gu, C., Maemura, T., Trifkovic, S., Wang, T., Babujee, L., Dahn, R., Halfmann, P. J., Barnhardt, T., Neumann, G., Suzuki, Y., Thompson, A., Swinford, A. K., Dimitrov, K. M., Poulsen, K., & Kawaoka, Y. (2024). Pathogenicity and transmissibility of bovine H5N1 influenza virus. *Nature 2024 633:8029*, *633*(8029), 426–432. https://doi.org/10.1038/s41586-024-07766-6

Garg, S., Reinhart, K., Couture, A., Kniss, K., Davis, C. T., Kirby, M. K., Murray, E. L., Zhu, S., Kraushaar, V., Wadford, D. A., Drehoff, C., Kohnen, A., Owen, M., Morse, J., Eckel, S., Goswitz, J., Turabelidze, G., Krager, S., Unutzer, A., … Olsen, S. J. (2025). Highly Pathogenic Avian Influenza A(H5N1) Virus Infections in Humans. *New England Journal of Medicine*, *392*(9), 843–854. https://doi.org/10.1056/NEJMOA2414610;SUBPAGE:STRING:FULL

Govindaraj, G., Sridevi, R., Nandakumar, S. N., Vineet, R., Rajeev, P., Binu, M. K., Balamurugan, V., & Rahman, H. (2018). Economic impacts of avian influenza outbreaks in Kerala, India. *Transboundary and Emerging Diseases*, *65*(2), e361–e372. https://doi.org/10.1111/TBED.12766

Kang, M., Wang, L. F., Sun, B. W., Wan, W. B., Ji, X., Baele, G., Bi, Y. H., Suchard, M. A., Lai, A., Zhang, M., Wang, L., Zhu, Y. H., Ma, L., Li, H. P., Haerheng, A., Qi, Y. R., Wang, R. L., He, N., & Su, S. (2024). Zoonotic infections by avian influenza virus: changing global epidemiology, investigation, and control. *The Lancet Infectious Diseases*, *24*(8), e522–e531. https://doi.org/10.1016/S1473-3099(24)00234-2

Kumar, I., Yadav, N., & Verma, A. (2025). Navigating artificial intelligence in scientific manuscript writing: Tips and traps. *Thieme-Connect.Com*, *35*(1), S178–S186. https://doi.org/10.1055/S-0044-1800801

Lycett, S. J., Duchatel, F., & Digard, P. (2019). A brief history of bird flu. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *374*(1775). https://doi.org/10.1098/RSTB.2018.0257

Rehman, S., Shehzad, A., Andriyani, L. D., Effendi, M. H., Abadeen, Z. U., Khan, M. I., & Bilal, M. (2023). A cross-sectional survey of avian influenza knowledge among poultry farmworkers in Indonesia. *PeerJ*, *11*. https://doi.org/10.7717/peerj.14600

Szablewski, C. M., Iwamoto, C., Olsen, S. J., Greene, C. M., Duca, L. M., Davis, C. T., Coggeshall, K. C., Davis, W. W., Emukule, G. O., Gould, P. L., Fry, A. M., Wentworth, D. E., Dugan, V. G., Kile, J. C., & Azziz-Baumgartner, E. (2023). Reported Global Avian Influenza Detections Among Humans and Animals During 2013-2022: Comprehensive Review and Analysis of Available Surveillance Data. *JMIR Public Health and Surveillance*, *9*(1). https://doi.org/10.2196/46383

Uyeki, T. M., Milton, S., Abdul Hamid, C., Reinoso Webb, C., Presley, S. M., Shetty, V., Rollo, S. N., Martinez, D. L., Rai, S., Gonzales, E. R., Kniss, K. L., Jang, Y., Frederick, J. C., De La Cruz, J. A., Liddell, J., Di, H., Kirby, M. K., Barnes, J. R., & Davis, C. T. (2024). Highly Pathogenic Avian Influenza A(H5N1) Virus Infection in a Dairy Farm Worker. *New England Journal of Medicine*, *390*(21), 2028–2029. https://doi.org/10.1056/NEJMC2405371;SUBPAGE:STRING:FULL