Association of Poultry Farms with Housefly and Morbidity: A Comparative Study from Raipur Rani, Haryana

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ABSTRACT

Background: Large poultry belt is located in the residential areas of rural Haryana in North India. Housefly problem has become a big nuisance in this area. Policy makers require evidence of the association of poultry farming with houseflies and its possible impact on the health of the population. Materials and Methods: A cross-sectional two-group comparison study was conducted. Six villages within 3 km and another six villages beyond 5 km from any poultry farms were selected as the study and the control villages, respectively. We measured indoor and outdoor housefly density and family morbidity in the last 1 month and observed the poultry hygiene and manure management practices. Findings: The mean fly density was 1737 (95% CI 697–2778) houseflies in study villages compared to 100 (95% CI 2–197) houseflies in the control area. The mean all-cause morbidity was also significantly higher in study village families compared to control village families. Poultry farm hygiene and use of insecticides and growth regulators were inadequate. Interpretation: Poultry farms are associated strongly with high fly density and high infectious morbidity in this area. Monitoring and regulation for poultry manure management practices and insecticide use practices need to be strengthened.

Keywords: Cross-sectional study, housefly, insecticides, poultry farming

Introduction

Housefly is a major domestic, medical, and veterinary pest that causes irritation, spoils food, and acts as a vector for many pathogenic organisms. During wars, housefly-associated typhoid fever had killed more soldiers than the enemy bullets. (1) Fly control is still an important public health measure in the 21st century.

Fly problem is an important concern internationally wherever poultry farming is an important economic activity. Chemical control methods have shown reduction in fly density and the incidence of fly-associated morbidities in various countries. (2-5) However, the chemical control for a routine long-term use can lead to the development of insecticide resistance. For effective management of the resistant populations, changing insecticides and application of unrelated insecticides, together with appropriate environmental sanitation measures, are necessary to keep the fly population under check. (6-8)

India is also on the international map for poultry farming. Raipur-Rani is the second largest poultry belt in India after Tamilnadu in South India. (9) Housefly menace has become a major problem in this area. (10) Public unrest in this area was reported in the leading newspapers. (11-13) However, an often-raised question is that what is the evidence that housefly problem is due to poultry farming? Whether this is only nuisance or is there any association with high morbidity? There is no documented evidence to this effect. This study is an attempt to answer these questions and document the current control measures that are being adopted in this area. The evidence will be useful not only at the local level, but also nationally and internationally wherever poultry farms are being
established. Specific study objectives were to determine the extent of housefly problem, to assess the impact of housefly problem on health and to document the control measures being adopted to tackle this problem.

**Materials and Methods**

**Study design**

A cross-sectional, two-group comparison study was conducted during May–June 2008. It involved a household survey, indoor and outdoor fly density measurements in the villages, and observation of poultry farm management practices.

**Setting**

In the Raipur-Rani block of rural Haryana of North India, six villages within a 3-km distance and another six villages beyond 5 km from any poultry farms were taken as study and control groups, respectively.

**Variables**

Indoor and outdoor fly density and 1-month prevalence of infectious diseases in the community were the primary outcome variables. Predictor variables were socioeconomic status, and waste disposal and defecation practices in the village. Poultry farm observations included general cleanliness and use of fly control measures.

**Measurements**

Ten respondents were interviewed randomly in each village to have a total sample size of 60 in each of the study as well as the control groups. For random selection, we went to the middle of the village, selected one street, and then the first house by simple random sampling and continued our interviews in consecutive houses till the required number of interviews were done, with one interview in each house.

We made 24 indoor and 30 outdoor fly density measurements. Indoor fly density measurements were done in 4 randomly selected houses out of the 10 included in the household survey. Five outdoor observations were made in each village – one in the middle of the village and one in each quadrant. In the selected household, fly bait/spot cards were placed at the sites where the houseflies could feed or where immature stages could develop, for example, wash basin, garbage handling area, or dustbin. Observations were carried out from 11 AM to 2:00 PM when the indoor housefly activity was high. We counted and recorded the number of houseflies attracted to the housefly bait for 5 min per housefly bait. Outdoor observations were done using fly bait and Scudder’s grill technique on a full sunshine day. No observation was recorded on cloudy and rainy day as it disturbs the housefly abundance. Observations were done in early morning and evening after identifying resting sites of houseflies. We placed the grill where there were natural housefly concentrations like outside of stables, landfills, and dumping areas randomly and counted the number of houseflies landing on the grill for 60 s.

We visited six poultry farms. These farms are in close proximity to each other spreading over a distance ranging 10–15 km.

**Statistical analysis**

The mean fly density for each village was calculated for indoor observations and outdoor observations separately. All fly density measurements for all the observations in the villages were added up and the mean fly density per village was calculated. The comparison of mean fly densities of control and study villages was done and two-sample *t*-test with equal variances was applied to test the difference between the two means. Various morbidities reported in the sampled houses were added up. The morbidity rate per 1000 population for each village and then average morbidity rate per village were calculated. The Pearson correlation coefficient was calculated to test the null hypothesis of no association of mean morbidity per village with the mean indoor housefly density.

**Results**

The socioeconomic profile of respondents with respect to caste, religion, housing, average family size, and average family income in the study villages was comparable with that in the control villages. Ninety-six percent respondents in the control and 91% in study area threw waste in the open fields. A toilet was available in 31% houses in the control, and 38% houses in the study area. Seventy-one percent children in the control and 61% in the study area defecated in the open [Table 1]. The mean age of all the family members for which morbidity in the last month was enquired was 28.4 (95% CI 26.6–30.3) years in the control and 28.7 (95% CI 26.8–30.5) years in the study area.

The mean fly density was 1737 (95% CI 697–2778) houseflies in the study villages compared to 100 (95% CI 2–197) houseflies in the control villages. The outdoor mean housefly density was 47 (95% CI 16–77) in the study and 3 (95% CI 0–5) in the control areas. The indoor fly density was 375 (95% CI 144–607) houseflies [Figure 1] in the study villages compared to 21 (95% CI 0.4–42) houseflies [Figure 2] in the control villages. In the last 1 month, the mean all-cause morbidity [Table 2] and the prevalence of diarrhea, fever, eye infection, and skin infection was significantly higher in study villages compared to control villages [Table 3]. The regression coefficient between mean morbidity and indoor fly density was
0.96 (95% CI 0.58–1.34) and Spearman’s correlation coefficient was 0.85 (P 0.001).

Poultry farm observations
Poultry farms were unclean, manure was stacked under cages of birds, feed was lying openly, and conditions were generally filthy. No ventilation fan was used on the farms to keep manure dry. Insecticide sprays and growth regulators are used irregularly and infrequently to control fly problems. Following insecticides are used in the poultry farms:
1. Novan7GR, DentopR spray containing organophosphorous compounds (Dichlorovos) used according to the direction on the label, i.e., 50 ml/15 l of water.
2. Eka®, Ectomin® sprays containing cypermethrin (Synthetic Pyrethoid) as an active ingredient, 20 ml/20 l of water.
There is no mechanism to monitor whether these insecticides are used in the recommended concentrations. Poultry farm owners decide to use these when there is a rise in the housefly population or when it becomes a problem on the farms.

**Insecticide use in villages**

Farm owners provide sugar + insecticide-mixed bait coated on “jute boris” (jute bags) to the villagers. People use these “boris” (bags) indoors to kill houseflies. Spraying is not regular in the villages. Some of the villages reported that more than 1.5 years elapsed since any spray was done in their villages.

**Manure management**

Droppings of the birds accumulate under cages. Accumulated manure is removed only two times in a year as it is costly to remove frequently.

**Use of growth regulators**

Most poultry farms follow a fixed schedule of insect growth regulators like cyromazine (50 g/100 kg of feed). They feed this drug continuously for 45 days and then give a break of 45 days. This is done in January–February, May–June, and August–September months of each year.

**Discussion**

To our knowledge, this is the first community-based study documenting the evidence of high fly density and high infectious morbidity associated with the existence of poultry farms in the vicinity. Waste disposal and open defecation practices were equally poor in both study as well control areas and were similar to the overall practices reported from rural Haryana from other surveys. Due to irregular insecticide spray operations, houseflies are becoming resistant. Resistance development to the insecticides is well reported in the literature.

Reported use of Cyromazine as a growth regulator seemed justified. However, there is no mechanism to know whether the recommended guidelines are being followed or not. Further, use of Cyromazine was not linked to fly monitoring and use of adulticides. It is recommended that Cyromazine treatment should start when flies become active and treatment should be continued for 4–6 weeks or until fly population is under control. Then Cyromazine is discontinued and the treatment is repeated when flies reestablish themselves. The use of an adulticide is recommended after each treatment, in order to control the influx of adult flies. It is also important to establish a homogenous mixture of Cyromazine in the feed. Cyromazine should be included into the feed only after a premix has been prepared.

Poultry farms have also failed to implement standard poultry farm hygiene practices. All the conditions on the poultry farm were in favor of housefly breeding. Eggs of the houseflies continue to thrive in the manure as it is an ideal environment for housefly breeding. Eggs remain in a dormant stage in this manure during winter months; therefore, the problem decreases in winters and again shoot up as the temperature starts rising in early spring months and thereafter. Villagers in the study villages also use poultry droppings as manure in their fields. This manure is potentially full of housefly eggs and larvae. An improper application of this manure can itself lead to the growth of houseflies in the area.

Higher morbidity for diarrhea and fever in the study villages may be due to poor water supply or poor hygienic practice or difference in the socioeconomic conditions. However, study villages had better water supply and had lesser unemployment. There was no significant difference in the educational status of the families and respondents. Therefore, study villages should have either lesser morbidity or there should be no difference in the morbidity rate. Thus it seems that greater housefly density in the study villages has led to a higher morbidity rate than the control villages and thus can be reduced with fly control. In Pakistan, control of houseflies led to a higher morbidity rate than the control villages and thus can be reduced with fly control. In Pakistan, control of houseflies led to a higher morbidity rate than the control villages and thus can be reduced.

Fly problem was significantly less in the control areas more than 5 km away from the poultry farm. The flight range of the houseflies is considered to be 7 km. Thus poultry farms should not be located within the 7- to 10-km radius from the residential area. Monitoring is an essential component of fly control programs as it provides the information needed to time adulticide applications. The fly density of —two to three flies per grill should warrant an immediate action. Larva monitoring provides the information needed to use larvicides, and for making changes in cultural practices. However, no systematic monitoring mechanism was in place.

To conclude, poultry farming has led to huge fly problem in the area. Improper insecticide use on the poultry farm, as well as in the villages, improper use of growth regulators in the poultry feed, inadequate poultry manure removal and management, and use of this poultry manure as fertilizers could be the major factors leading to a high fly density in the area. Urgent and appropriate administrative and public health actions need to be initiated. Monitoring tools used in the survey can be used by the administration as well as by the poultry farm owners to track the fly density, and observe poultry manure management practices. Educational campaigns should be initiated to enable villagers use the poultry manure properly.
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