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## Socio-economic status, health care and antimicrobial usage practices adapted by pig rearers in and around Bengaluru, Karnataka, India

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### Abstract

The present study has been designed to evaluate the socio-economic, health care and antimicrobial usage practices adapted by pig farmers. A total of 50 pig farmers engaged in commercial pig rearing in and around Bengaluru were surveyed using structured questionnaire to collect details of socio-economic status, household characteristics, feeding and manage mental practices, health care, hygiene and antimicrobial usage pattern to assess their knowledge, perception and attitude towards antibiotics. The results of the survey, indicated that majority of the pig farmers were small and marginal farmers (66%) belonging to other backward communities (44%) followed by scheduled caste (38%) and 96 percent of the farmers were Hindus. All the farmers (100%) practiced stall feeding and kitchen/hotel waste was the major source of feed for their pigs and regular vaccination (90%) against Foot and Mouth disease (FMD) and swine fever was being carried out. None of the farmers had records of antibiotic treatment of the pigs and they generally consulted veterinarians (68%) before use of antibiotics; however the antibiotics were administered by themselves or by the farm workers (80%). The major antibiotics used were tetracycline followed by enrofloxacin, sulphonamides (Co-trimazole) and Streptopenicillin. The antibiotics were used to treat respiratory/skin diseases, pyrexia, diarrhoea and urogenital infections / abortion in majority of the farms.

**Keywords:** Pig farmers, survey, antibiotics, pigs

### Introduction

In developing countries like India, rearing of livestock especially pigs and poultry plays an important role in improving the socio-economic status of the poor and marginal farmers. The pig farming system in major parts of India are highly unorganized and has been practiced as family subsistence system or under backyard system with lower inputs in terms of feed, lower antimicrobial usage and demand driven production system (Vinodh Kumar *et al.*, 2019) [27]. Generally, rearing of pigs as compared to other livestock systems has been looked up by the farmers as a sector which provides higher economic returns with less inputs attributed to the various inherent quality traits such as high fecundity, better feed conversion efficiency, early maturity, and short generation interval (Sidhartha *et al.*, 2020) [23]. In the recent past, there has been a significant transformation in pig farming in India from backyard system of rearing to small / medium or larger commercial farms owing to the high demand for animal protein. However, with the increase in scale of productivity, animals have been exposed to various infections and hence use of antibiotics is often regarded as the simplest way to maintain healthy and productive animals ignoring the biosecurity measures which are presumed by the farmers to be expensive (Manyi-Loh *et al.*, 2018) [14]. In addition, over the counter availability of antimicrobials and poor access to Veterinary facilities have also contributed to the extensive use of antimicrobials by the livestock owners, which in turn has contributed to the emergence of AMR in livestock production system in India (Kotwani *et al.*, 2021) [10].

Generally, farmers depend on para-vets or non-professionals rather than veterinarians for treatment due to accessibility and charges to be paid for professionals (Kumar and Gupta, 2018; Mutua *et al.*, 2020) [12, 16]. However, documentation of the socio-demographic details of pig farmers, farm characteristics, antimicrobial usage and knowledge and perception on antibiotics in pork production system in India is lacking. Hence, the present study was carried out to determine the various practices adapted by the farmers involved in pig rearing in and around Bengaluru, Karnataka, India.

## Material and Methods

The present study was carried out in and around Bengaluru (Bengaluru rural and Bengaluru urban). A total of 50 pig farms were selected and based on mixed method approach of Participatory rural appraisal (PRA) and rapid ethnographic assessment (REA) preliminary data regarding socio-demographic characteristics of pig farmers, farm characteristics, farming practices, hygiene and health care and knowledge, perception and antimicrobial usage in the pig farm was collected using a structured questionnaire. The farm socio-demographic characteristics studied included house hold size, land owned, agriculture activities, religion and social group of the farmers involved in pig rearing. The farm characteristics assessed were number of animals, type of housing, feeding practices, breed maintained and production activities. The health care and hygiene measures assessed includes cleaning activities adopted, vaccination protocols, biosecurity measures employed and quarantine facilities for sick animals. Data collection regarding the knowledge, perception and use of antibiotics was carried out to evaluate different aspects of antibiotic usage *viz.*, role of veterinarians, commonly used antibiotics, reason for use of antibiotics and purpose for antibiotic use in pig rearing (growth promotion). The data collected were analysed using Epi Info™ software.

## Results and Discussion

The socio-economic, demographic and antimicrobial usage (AMU) patterns employed by the farmers in the farms under this study are presented in Table 1 to 3.

**Household characteristics of pig farmers:** The house hold characteristics of the pig farmers in and around Bengaluru

(Table 1) based on survey revealed that majority of the pig farmer's household size was medium (68%) with 5-10 members in their family and agriculture was the major occupation (90%). These observations are in accordance with the report of Majunder *et al.* (2020) [13] who recorded that majority of the pig rearers were landless, marginal and small farmers in Telangana State. Similar findings have been documented by Tudu *et al.* (2015) [26] in West Bengal, Anand Kumar *et al.* (2017) [3] in Uttar Pradesh, Ritchil *et al.* (2013) [19] in Bangladesh, Mekuriaw and Asmare (2014) [15] in North-western Ethiopia, who also reported that majority of pigfarmers, were poor and landless. It was evident that majority of the pig farmers in the study area were small and marginal farmers (66%) belonging to other backward communities (44%) followed by scheduled caste (38%) and 96 percent of the pig farmers were Hindus. The findings were in accordance with Dileep Kumar *et al.* (2014) [5] in pig farmers from five states of India and Muhindro Singh *et al.* (2016) [27] in Tripura. However, contrary to the findings of this study, Majunder *et al.* (2020) [13] in Telangana State and Ahmed *et al.* (2017) [2] in Assam observed that majority of pig farmers belonged to Schedule Tribes followed by Scheduled Castes and Backward Classes. The survey indicated that most of the pig farmers had own land (96%) and irrigation was the most common source of water for cultivation of crops. Income generation from piggery alone contributed to only around 12 percent whereas, majority of the farmers practiced integrated farming with agricultural crops along with piggery and other animal husbandry activities (88%). The difference observed may be attributed to the geographical location, the population of different communities and governmental schemes prevalent in that particular location.

**Table 1:** Household characteristics of pig farmers in and around Bengaluru

| Sl. No. | Household characteristics       | Range                                     | Percent |
|---------|---------------------------------|---|---------|
| 1.      | Household size                  | 0-5                                       | 28.00   |
|         |                                 | 5-10                                      | 68.00   |
|         |                                 | >10                                       | 4.00    |
| 2.      | Household type                  | Agriculture                               | 90.00   |
|         |                                 | Non-Agriculture                           | 8.00    |
|         |                                 | Regular wage/salary earning               | 2.00    |
| 3.      | Religion                        | Christianity                              | 4.00    |
|         |                                 | Hindu                                     | 96.00   |
| 4.      | Social group                    | Other backward classes                    | 44.00   |
|         |                                 | others                                    | 6.00    |
|         |                                 | Schedule caste                            | 38.00   |
|         |                                 | Schedule tribe                            | 12.00   |
| 5.      | Whether own any Land?           | Yes                                       | 96.00   |
|         |                                 | No  | 4.00    |
| 6.      | Total possessed land (in acres) | Marginal, < 2.5acre                       | 22.00   |
|         |                                 | Small 2.5-5acre                           | 44.00   |
|         |                                 | Medium 5-10acre                           | 30.00   |
|         |                                 | Large > 10acre                            | 4.00    |
| 7.      | Land irrigated (in acres)       | Marginal, < 2.5acre                       | 42.00   |
|         |                                 | Small 2.5-5acre                           | 50.00   |
|         |                                 | Medium 5-10acre                           | 6.00    |
|         |                                 | Large > 10acre                            | 2.00    |
| 8.      | Land cultivate (in acres)       | Marginal, <2.5acre                        | 36.00   |
|         |                                 | Small 2.5-5acre                           | 54.00   |
|         |                                 | Medium 5-10acre                           | 8.00    |
|         |                                 | Large > 10acre                            | 2.00    |
| 9.      | Income of house hold (in lakhs) | 0-2.5                                     | 4.00    |
|         |                                 | 2.5-5                                     | 36.00   |
|         |                                 | 5-10                                      | 46.00   |
|         |                                 | > 10                                      | 14.00   |
| 10.     | Sources of Income               | Agriculture and piggery rearing           | 62.00   |
|         |                                 | Agriculture, animal husbandry and piggery | 26.00   |
|         |                                 | Piggery rearing                           | 12.00   |

### Feeding and hygiene practices

The results (table.2) indicated that all the farmers (100%) practiced stall feeding and kitchen / hotel waste was the major source of feed for their pigs (75%), followed by mix of concentrate and hotel waste (23%) and only 2 percent of the farmers exclusively fed concentrate feed to their pigs. The findings were on par with observations of Kannan (2005)<sup>[9]</sup> in Kerala, Deka *et al.* (2007)<sup>[4]</sup> in Assam, Radhakrishnan *et al.* (2018)<sup>[18]</sup> in Thrissur and Ernakulam in Kerala, Sangli *et al.* (2018)<sup>[21]</sup> in Tamil Nadu and Majunder *et al.* (2020)<sup>[13]</sup> in Telangana state, who opined that swill feed (kitchen/hotel waste) and slaughter house offals were the major feed provided to the pigs. With respect to the health care management majority of the farmers practiced regular vaccination (90%) and the pigs were vaccinated against Foot and Mouth disease (FMD) and swine fever and some farmers did practice vaccination against Hemorrhagic septicemia (HS). In addition, it was observed that 92 percent of the farms had quarantine facilities for segregation and treatment of sick

animals. This could be attributed to the availability of the vaccines against these diseases in the state of Karnataka. Similar finding has been reported by Nanda *et al.* (2018)<sup>[17]</sup> in organized farms in Mizoram. However, contrary to the findings of this study, poor vaccination rate in pig farms has been reported by Majunder *et al.* (2020)<sup>[13]</sup> in Telangana state, Sasikala *et al.* (2012)<sup>[12]</sup> in Tamil Nadu, Roy (2014)<sup>[20]</sup> in West Bengal, Ahmed *et al.* (2016)<sup>[28]</sup> in Tripura. The reason for discrepancies in vaccination status between studies might be attributed to lack of knowledge of vaccines against most harmful diseases of pigs, ignorance and non-availability of vaccines in rural areas as compared to the present study. In terms of hygiene practices followed, it was observed that majority of the farmers practiced cleaning of the sheds twice daily (64%), with water being the major product (70%) used for cleaning followed by water with detergent and phenyl (28%). Biosecurity measures in the farms were very poor and majority of the farmers did not practice any precautions and only few farms had foot dips.

**Table 2:** Feeding and hygiene practices followed by pig farmers in and around Bengaluru

| Sl. No. | Practices                                       | Range  | Percent |
|---------|---|--|---------|
| 1.      | Feeding mechanism                               | Stall feeding  | 100.00  |
| 2.      | Main feed for Pigs                              | Only Edible kitchen / hotel waste                      | 75.00   |
|         |   | Only concentrate feed                                  | 2.00    |
|         |   | Mix of both  | 23.00   |
| 3.      | Whether Kitchen waste is cooked before feeding? | Yes  | 20.00   |
|         |   | No   | 80.00   |
| 4.      | How often you clean the sheds?                  | Once a day   | 30.00   |
|         |   | Twice a day  | 64.00   |
|         |   | Thrice a day   | 6.00    |
| 5.      | Product used to clean the shed                  | Detergents and Phenyl                                  | 28.00   |
|         |   | Only Water   | 70.00   |
|         |   | QAC  | 2.00    |
| 6.      | Do you vaccinate the pigs?                      | Yes  | 90.00   |
|         |   | No   | 10.00   |
| 7.      | What are all the diseases you vaccinate?        | FMD, HS and Swine fever                                | 30.00   |
|         |   | FMD, Swine fever                                       | 65.00   |
|         |   | FMD, Swine fever, Porcine circovirus, Swine mycoplasma | 5.00    |
| 8.      | Do you isolate/quarantine the diseased pigs?    | Yes  | 92.00   |
|         |   | No   | 8.00    |
| 9.      | Precautions taken while entering the farm       | No precautions   | 68.00   |
|         |   | Head gear, mask, gloves                                | 4.00    |
|         |   | Foot dips/Rubs   | 28.00   |
| 10.     | How do you dispose the manure of the farm?      | As a manure for farm                                   | 87.00   |
|         |   | For fish pond  | 13.00   |

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|         |   | No   | 80.00   |
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|         |   | FMD, Swine fever                                       | 65.00   |
|         |   | FMD, Swine fever, Porcine circovirus, Swine mycoplasma | 5.00    |
| 8.      | Do you isolate/quarantine the diseased pigs?    | Yes  | 92.00   |
|         |   | No   | 8.00    |
| 9.      | Precautions taken while entering the farm       | No precautions   | 68.00   |
|         |   | Head gear, mask, gloves                                | 4.00    |
|         |   | Foot dips/Rubs   | 28.00   |
| 10.     | How do you dispose the manure of the farm?      | As a manure for farm                                   | 87.00   |
|         |   | For fish pond  | 13.00   |

**Knowledge, perception and antimicrobial usage:** It was evident that (Table.3) majority of the farmers were aware of administration of (84%) to pigs. But majority of them were unaware about the use of antibiotics in feed or whether the feed provided to their pigs contained antimicrobials (92%) or not. However, in spite of use of antibiotics in their farm premises majority of them did not have the record of the animals that were treated, usage of antibiotics., the dosage and duration of the treatment (78%); However, antibiotics were generally used for treatment of the diseased animal (94%) rather than as prophylaxis. The pig farmers in and around Bengaluru consulted veterinarians (68%) and para veterinarians (22%) regarding the use of antibiotics to their animals. However, after consultation, the antibiotics were being procured over the counter in human pharmacies and were administered (injection or oral) by farmers themselves or by the farm workers in majority of the instances (80%) and only in few instances veterinarians/para veterinarians administered the antibiotics to the animals (10% each).

The major antimicrobials used in pig farms in and around Bengaluru were tetracycline followed by enrofloxacin, sulphonamides (Co-trimazole) and streptopenicillin both as injectable and oral solutions. Few farms also used Gentamycin and Ceftriaxone for treatment of animals. The higher use of tetracycline and enrofloxacin in this study may be attributed to its broad spectrum of activity, easy availability, lower cost and ease of administration (oral through drinking water) (Trouchon and Lefebvre, 2016) [25]. In addition, farmers prefer to use medicines that provides them quick results, its availability, their previous experience with the drug while managing similar symptoms and advice from

veterinarians (Kumar and Gupta, 2018) [12]. In similar lines, Kumar *et al.* (2020) [11] reported that tetracycline, penicillin, ampicillin, cephalosporin, cephalaxin and amoxicillin plus clavulanic acid were the most commonly used antibiotics in pigs in Arunachal Pradesh, Assam and Meghalaya. Similar to the findings of this study, Donkor *et al.* (2012) [6] observed that 98 percent of the livestock keepers used antibiotics and the major antibiotics used were penicillin, oxy-tetracycline, streptomycin, sulphonamides and tylosin in Ghana. In Nepal, the most common antibiotics used in animal sectors were tetracyclines, sulfa drugs, macrolides, polymyxins, quinolones and aminoglycosides, whereas, chloramphenicol was the least antibiotic used in the veterinary sector (Subramanya *et al.*, 2021) [24].

The farmers revealed that antibiotics were generally used to treat respiratory/skin diseases, pyrexia, diarrhoea or gastrointestinal disturbances and urogenital infections/abortion in majority of the farms. The findings were in accordance with Adesokan *et al.* (2015) [1] in Nigeria, Gameda *et al.* (2020) [27] in Ethiopia, Donkor *et al.* (2012) [6] in Ghana, Mutua *et al.* (2020) [16] in India, who opined that antibiotics were generally administered to livestock to treat respiratory diseases, fever and in general broad spectrum antibiotics were administered. In similar lines, Gruel *et al.* (2021) [8] reported that the main causes for which antimicrobials were given were respiratory diseases in pigs (45.5%), skin diseases in cattle (41.7%) and respiratory and digestive diseases in poultry (66.7%).

**Table 3:** Knowledge, perception and antimicrobial usage in pig farms in and around Bengaluru

| Sl. No. | Practices  | Percent                     |       |
|---------|--|-----------------------------|-------|
| 1.      | Do you give your pig any antibiotics /antimicrobials?                                | Yes                         | 84.00 |
|         |  | No                          | 16.00 |
| 2.      | Are you aware of antibiotics / antimicrobials included in the feed?                  | Yes                         | 8.00  |
|         |  | No                          | 92.00 |
| 3.      | Do you keep records of drugs used in the farm?                                       | Yes                         | 22.00 |
|         |  | No                          | 78.00 |
| 4.      | Do you usually consult anybody for use of Antibiotics / anti microbials in the farm? | Yes                         | 94.00 |
|         |  | No                          | 6.00  |
| 5.      | Whom do you consult?   | Para Veterinarian           | 38.00 |
|         |  | Veterinarian                | 62.00 |
| 6.      | Who usually administers drugs to the pigs?   | Self/ Farm worker           | 80.00 |
|         |  | Para Veterinarian           | 10.00 |
|         |  | Veterinarian                | 10.00 |
| 7.      | Where do you purchase the antibiotics used in pigs                                   | Human Pharmacy              | 82.00 |
|         |  | Veterinary pharmacy         | 18.00 |
| 8.      | Purpose for which Antibiotics given  | Disease treatment           | 94.00 |
|         |  | Prevention of disease       | 6.00  |
| 9.      | Antibiotics/ anti microbials usage in the Farm                                       | Co-trimoxazole              | 48.00 |
|         |  | Tetracycline                | 72.00 |
|         |  | Enrofloxacin                | 62.00 |
|         |  | Streptopenicillin           | 42.00 |
|         |  | Gentamycin                  | 5.00  |
| 10.     | Conditions for which antibiotics are used  | Ceftriaxone                 | 10.00 |
|         |  | Diarrhoea                   | 84.00 |
|         |  | Respiratory/ skin infection | 90.00 |
|         |  | Pyrexia                     | 96.00 |
|         |  | Urogenital/ abortions       | 16.00 |

## Conclusions

The results of the present study clearly indicated that pig

rearing has been primarily practised by small and marginal farmers belonging to the backward community. It was also evident that majority of the pig farms fed kitchen waste without heat processing and biosecurity measures were very poor. The usage of antimicrobials in the farms studied indicated that antibiotics were administered by the farm workers / owner in the absence of Veterinarian in the farms, which might result in use of inappropriate or sub-therapeutic doses, which is considered to be one of the major causes for emergence of AMR. Based on the findings of this study, it may be concluded that socio-economic status, health and hygiene practices and AMU at the pig farms may have a direct or indirect impact on the emergence of antimicrobial resistant pathogens and commensals in pork production system.

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