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Socio-economic factors and management practices in influencing the health and sustainability of pig farming in Dakshina Kannada, India

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Abstract

The present study has been designed to evaluate the Socio-economic factors and Management Practices in influencing the Health and Sustainability of Pig farming in Dakshina Kannada, India. A total of 50 pig farmers engaged in commercial pig rearing in Dakshina Kannada district were surveyed using structured questionnaire to collect details of socio-economic status, household characteristics, feeding and management 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 pig farmers were landless or small-scale farmers, with 74% belonging to other backward communities (OBC), 16% to Scheduled Tribes (ST), and 14% to Scheduled Castes (SC). A significant portion (74%) of the farmers were Christians. All the farmers (100%) practiced stall feeding, with kitchen or hotel waste being the primary source of feed for their pigs. This suggests a reliance on easily accessible and low-cost feeding methods. Vaccination against Foot and Mouth Disease (FMD) and swine fever was common, with 90% of farmers regularly vaccinating their pigs. Although 67% of farmers consulted veterinarians before using antibiotics, 85% administered the antibiotics themselves or had them administered by farm workers. The most commonly used antibiotics were enrofloxacin, tetracycline, sulphonamides (Co-trimazole), and Streptopenicillin. These antibiotics were primarily used to treat respiratory and skin diseases, pyrexia, diarrhea, and urogenital infections. None of the farmers maintained records of antibiotic treatments, which could be a concern for tracking antibiotic use and preventing antibiotic resistance.

Keywords: Pig farmers, Dakshina Kannada, antibiotics, pigs

Introduction

The growing human population in India and globally has significantly increased the demand for food, including agricultural and animal products, to meet economic, social, and dietary needs. Consequently, producers are transitioning from traditional, low-profit, low-productivity extensive animal rearing systems to intensive production methods. This shift, seen in both small and large-scale operations, is viewed as a more profitable approach that ensures animal welfare and contributes to global food security (Robinson *et al.*, 2011)^[20]. However, with all the advantages the intensive animal production carries change in livelihoods of small and marginal farmers (Otte *et al.*, 2019)^[17].

In developing countries like India, livestock rearing, particularly pig and poultry farming, is crucial for improving the socio-economic status of poor and marginal farmers. However, the pig farming system in many parts of India remains highly unorganized. It is commonly practiced as a family subsistence or backyard system, characterized by

lower inputs in terms of feed and antimicrobial usage, and driven by demand (Vinodh Kumar *et al.*, 2019)^[28]. Pig farming is often seen by farmers as a sector that offers higher economic returns with relatively lower inputs compared to other livestock systems. This perception is due to several inherent qualities of pigs, including high fecundity, better feed conversion efficiency, early maturity, and a short generation interval (Sidhartha *et al.*, 2020)^[24]. In recent years, pig farming in India has undergone a notable shift from backyard rearing systems to small, medium, and large commercial farms due to the growing demand for animal protein. However, with this increase in scale, there has been a corresponding rise in infections among animals. Consequently, many farmers consider antibiotics as the simplest method to maintain animal health and productivity, often neglecting biosecurity measures that are perceived to be costly (Manyi-Loh *et al.*, 2018)^[13]. In addition, the over-the-counter availability of antimicrobials and limited access to veterinary facilities have significantly contributed to the

extensive use of antimicrobials by livestock owners in India. This extensive use has, in turn, led to the emergence of antimicrobial resistance (AMR) in the livestock production system (Kotwani *et al.*, 2021)^[9].

Farmers in many regions often depend on para-vets or non-professionals for the treatment of their livestock rather than qualified veterinarians. This preference is primarily due to the greater accessibility and lower charges associated with para-vets and non-professional services (Kumar and Gupta, 2018; Mutua *et al.*, 2020)^[11, 15]. The documentation of socio-demographic details of pig farmers, farm characteristics, antimicrobial usage, and knowledge and perception of antibiotics in pork production systems in India is notably lacking. This gap in data hinders the development of effective strategies to improve pig farming practices and address issues such as antimicrobial resistance. The present study was conducted to determine the various practices adopted by farmers involved in pig farming in Dakshina Kannada district, Karnataka, India.

Materials and Methods

The study was conducted in Dakshina Kannada district, Karnataka, India. A total of 50 pig farmers engaged in commercial pig rearing were surveyed. These farmers were selected using a stratified random sampling method to ensure a representative sample of the pig farming community in the district. Preliminary Data was collected using a structured questionnaire which included the Socio-Demographic Details like Age, gender, education level, land ownership, community, and religion. The Farm Characteristics like Type of pig farming (backyard, small/medium, large-scale), feeding practices, housing, and hygiene measures. Antimicrobial Usage like Types of antibiotics used, purpose of use (disease treatment, growth promotion), and administration practices, knowledge and Perception about Awareness and understanding of antibiotic use, perception of antibiotic resistance, and attitudes towards biosecurity measures. The collected data were analyzed using Epi Info™ software, which facilitated statistical computations and data visualization to interpret the epidemiological trends effectively.

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 in Dakshina Kannada District, Karnataka: The survey results presented in Table 1 reveal that the majority of pig farmers in Dakshina Kannada district had small household sizes, with 68% of households comprising 0-5 members. Agriculture emerged as the predominant occupation, with 90% of the respondents engaged in farming activities. These findings are consistent with the observations made by Majunder *et al.* (2020)^[12] reported that the majority of pig rearers in Telangana State were landless, marginal, and small-scale farmers. Similar findings have been documented by Tudu *et al.* (2015)^[27] in West Bengal, Ritchil *et al.* (2013)^[19] in Bangladesh, Mekuriaw and Asmare (2014)^[14] in North-western Ethiopia, where the majority of pig farmers were also reported to be poor and landless. The survey revealed that the majority of pig farmers in the study area were landless and small-scale farmers (74%), with a

significant proportion belonging to Other Backward Communities (64%), followed by Scheduled Tribes (16%) and Scheduled Castes (14%). Additionally, 74% of the pig farmers were Christians. These findings are consistent with those of Dileep Kumar *et al.* (2014)^[4], who studied pig farmers across five states in India. However, contrary to the findings of this study, Majunder *et al.* (2020)^[12] in Telangana State and Ahmed *et al.* (2017)^[2] in Assam observed that the majority of pig farmers belonged to Scheduled Tribes, followed by Scheduled Castes and Backward Classes. The survey also indicated that most pig farmers owned land (96%), and irrigation was the most common source of water for crop cultivation. Income generation from pig farming alone contributed to approximately 52% of the household income, while 48% of the farmers practiced integrated farming, combining pig farming with agricultural crops and other animal husbandry activities. The observed differences in community representation and farming practices may be attributed to the geographical location and the differing population demographics, as well as the cultural significance and consumption of pork in these regions.

Feeding and Hygiene Practices Among Pig Farmers in Dakshina Kannada: The results (Table 2) revealed that all the pig farmers (100%) practiced stall feeding. The major source of feed was kitchen and hotel waste, used by 75% of the farmers. This was followed by a mix of concentrate and hotel waste, used by 23% of the farmers, while only 2% of the farmers exclusively fed concentrate feed to their pigs. These findings are consistent with observations made by Kannan (2005)^[8] in Kerala, Deka *et al.* (2007)^[3] in Assam, Radhakrishnan *et al.* (2018)^[18] in Thrissur and Ernakulam in Kerala, Sangli *et al.* (2018)^[22] in Tamil Nadu, and Majunder *et al.* (2020)^[12] in Telangana, who also noted that swill feed (kitchen/hotel waste) and slaughterhouse offals were the primary feed sources for pigs. The survey results indicated that the majority of pig farmers in Dakshina Kannada practiced regular vaccination, with 90% of them vaccinating their pigs against Foot and Mouth Disease (FMD) and swine fever. Additionally, some farmers also vaccinated their pigs against Hemorrhagic Septicemia (HS). It was also observed that 92% of the farms had quarantine facilities for the segregation and treatment of sick animals. The high rate of vaccination and the presence of quarantine facilities can be attributed to the availability of vaccines against these diseases in Karnataka. These findings are consistent with those reported by Nanda *et al.* (2018)^[16] in organized farms in Mizoram. However, contrary to the findings of this study, poor vaccination rates in pig farms have been reported in other regions, including Telangana (Majunder *et al.*, 2020)^[12], Tripura (Sharma *et al.*, 2015; Ahmed *et al.*, 2016)^[2], Tamil Nadu (Sasikala *et al.*, 2012)^[23], and West Bengal (Roy, 2014)^[21]. The differences in vaccination rates may be due to regional variations in vaccine availability, farmer awareness, or access to veterinary services. The discrepancies in vaccination status between this study and others may be attributed to several factors, including a lack of knowledge about vaccines for the most harmful pig diseases, ignorance, and the non-availability of vaccines in rural areas, which contrasts with the current study's findings. In Dakshina Kannada, the availability of vaccines and awareness among farmers likely contributed to the higher vaccination rates observed. In

terms of hygiene practices, the majority of farmers (64%) cleaned their pig sheds twice daily, predominantly using water (70%) as the primary cleaning agent. A smaller proportion of farmers (28%) used a combination of water with detergent and phenyl for cleaning. Despite these

efforts, biosecurity measures were found to be very poor. Most farmers did not practice any significant precautions to prevent disease transmission, and only a few farms had foot dips in place to enhance biosecurity.

Table 1: Household Characteristics of Pig Farmers in Dakshina Kannada District, Karnataka

Sl. No.	Household characteristics	Range	Percent
1.	Household size	0-5	68.00
		5-10	28.00
		>10	4.00
2.	Household type	Agriculture	90.00
		Non-Agriculture	8.00
		Regular wage/salary earning	2.00
3.	Religion	Christianity	74.00
		Hindu	36.00
4.	Social group	Other backward classes	64.00
		others	6.00
		Schedule caste	14.00
		Schedule tribe	16.00
5.	Whether own any Land?	Yes	96.00
		No	4.00
6.	Total possessed land (in acres)	Marginal, < 2.5acre	74.00
		Small 2.5-5acre	16.00
		Medium 5-10acre	6.00
		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	26.00
		Agriculture, animal husbandry and piggery	22.00
		Piggery rearing	52.00

Table 2: Feeding and hygiene practices followed by pig farmers in Dakshina Kannada

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

Knowledge, perception and antimicrobial usage Among Pig Farmers in Dakshina Kannada: According to Table 3, the majority of farmers (78%) were aware that antibiotics are administered to pigs. However, most were unaware of whether the feed provided to their pigs contained antimicrobials, with 89% being unsure about the presence of antibiotics in the feed. Despite using antibiotics on their farms, a significant portion of farmers (85%) did not maintain records of treated animals, the antibiotics used, or the dosage and duration of treatment. Antibiotics were primarily used for treating diseased animals (86%) rather than for preventive purposes. Regarding consultation, farmers primarily sought advice from veterinarians (67%) and para-veterinarians (33%) on the use of antibiotics. However, after consultation, antibiotics were often purchased over the counter at human pharmacies and administered by the farmers themselves or their farm workers in most cases (85%). Only a small percentage of antibiotics were administered by veterinarians or para-veterinarians (15% each).

The major antimicrobials used in pig farms in Dakshina Kannada were Enrofloxacin, followed by tetracycline, sulfonamides (Co-trimoxazole), and Streptopenicillin, administered as both injectable and oral solutions. A few farms also utilized Gentamycin and Ceftriaxone for treating animals. The prevalent use of Enrofloxacin and tetracycline in this study can be attributed to their broad-spectrum activity, easy availability, low cost, and ease of administration (e.g., orally through drinking water) (Troughon and Lefebvre, 2016) [26]. Additionally, farmers tend to prefer medicines that provide quick results, are

readily available, and are recommended by veterinarians, as well as those they have previously used with success in managing similar symptoms (Kumar and Gupta, 2018) [11]. In a similar vein, Kumar *et al.* (2020) [10] reported that tetracycline, penicillin, ampicillin, cephalosporin, cephalexin, and amoxicillin plus clavulanic acid were the most commonly used antibiotics in pigs in Arunachal Pradesh, Assam, and Meghalaya. Likewise, Donkor *et al.* (2012) [5] found that 98% of livestock keepers in Ghana used antibiotics, with penicillin, oxytetracycline, streptomycin, sulfonamides, and tylosin being the most frequently used. In Nepal, the most commonly used antibiotics in the animal sector were tetracyclines, sulfa drugs, macrolides, polymyxins, quinolones, and aminoglycosides, while chloramphenicol was the least used in the veterinary sector (Subramanya *et al.*, 2021) [25].

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 similarity with Adesokan *et al.* (2015) [1] in Nigeria, Gameda *et al.* (2020) [6] in Ethiopia, Donkor *et al.* (2012) [5] in Ghana, Mutua *et al.* (2020) [15] 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) [7] reported that respiratory diseases in pigs (45.5%), skin diseases in cattle (41.7%), and respiratory and digestive diseases in poultry (66.7%) were the main reasons for administering antimicrobials.

Table 3: Knowledge, perception and antimicrobial usage in pig farms in Dakshina Kannada

Sl. No.	Practices		Percent
1.	Do you give your pig any antibiotics /antimicrobials?	Yes	78.00
		No	22.00
2.	Are you aware of antibiotics / antimicrobials included in the feed?	Yes	8.00
		No	89.00
3.	Do you keep records of drugs used in the farm?	Yes	15.00
		No	85.00
4.	Do you usually consult anybody for use of Antibiotics / anti microbials in the farm?	Yes	91.00
		No	9.00
5.	Whom do you consult?	Para Veterinarian	33.00
		Veterinarian	67.00
6.	Who usually administers drugs to the pigs?	Self/ Farm worker	85.00
		Para Veterinarian	15.00
		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	62.00
		Enrofloxacin	68.00
		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

Conclusion

The results of the present study reveals that pig rearing is primarily practiced by small and marginal farmers from backward communities. A significant number of pig farms were found to feed their pigs kitchen waste without heat processing, and biosecurity measures were generally poor. Antibiotics were often administered by farm workers or owners without the guidance of a veterinarian. This practice can lead to the use of inappropriate or sub-therapeutic doses of antibiotics, which is a known contributor to the emergence of antimicrobial resistance. The study concludes that the socio-economic status of farmers, their health and hygiene practices, and their use of antimicrobials may have a direct or indirect impact on the emergence of antimicrobial-resistant pathogens and commensals in the pork production system.

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