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PREVALENCE OF GASTROINTESTINAL NEMATODE INFECTION IN PIGLETS ON PIG BREEDING FARMS IN GIANYAR DISTRICT

Prevalensi Infeksi Nematoda Gastrointestinal Pada Anak Babi Di Peternakan Pembibitan Babi Di Kabupaten Gianyar

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Abstract

Nematodiosis in piglets can inhibit nutrient absorption, leading to decreased growth performance. This study aimed to determine the prevalence of gastrointestinal nematode infections in piglets during the suckling and weaning phases at pig breeding farms in Gianyar Regency. This was a cross-sectional study with a purposive sampling method. A total of 216 fecal samples from suckling and weaning phase piglets from seven subdistricts in Gianyar Regency were used in the study. Fecal samples were examined using the flotation concentration method with saturated salt (NaCl) to identify nematode worm eggs. Prevalence data were described descriptively, while the Chi-square test was used to determine differences in nematode infection of suckling and weaning phase piglets. The results showed that the prevalence of nematodes was 41.66% (90/216), consisting of Strongyl type (33.33%), *Ascaris suum* (14.81%), *Trichuris suis* (6.48%), and *Strongyloides ransomi* (1.38%). The prevalence of nematode infection in weaning pigs (49.61%, 64/129) was higher ($p<0.05$) than that in the suckling pigs (29.88%, 26/87). Nematode co-infection in piglets was also observed in this study. The prevalence of nematode infection in piglets is notably high, particularly during the weaning phase of life. Consequently, it is advisable to implement nematode eradication strategies before weaning and to repeat these measures post-weaning.

Keywords: nematodiosis, prevalence, suckling pig, weaning pig

Abstrak

Nematodiosis pada anak babi dapat menyebabkan terhambatnya penyerapan nutrisi sehingga dapat menyebabkan penurunan performa pertumbuhan. Tujuan dari penelitian ini adalah untuk mengetahui prevalensi infeksi nematoda gastrointestinal pada anak babi fase menyusu dan

sapih di peternakan pembibitan babi di Kabupaten Gianyar. Penelitian ini merupakan *cross sectional study* dengan metode *purposive sampling*. Sebanyak 216 sampel feses anak babi fase menyusu dan sapih yang berasal dari tujuh kecamatan di Kabupaten Gianyar digunakan dalam penelitian. Sampel feses diperiksa menggunakan metode konsentrasi pengapungan dengan garam (NaCl) jenuh untuk identifikasi telur cacing nematoda. Data prevalensi dijabarkan secara deskriptif, sedangkan untuk mengetahui perbedaan infeksi nematoda anak babi fase menyusu dan sapih digunakan uji *Chi-square*. Hasil penelitian menunjukkan bahwa prevalensi nematoda adalah sebesar 41,66% (90/216), yang terdiri dari tipe *Strongyl* (33,33%), *Ascaris suum* (14,81%), *Trichuris suis* (6,48%), dan *Strongyloides ransomi* (1,38%). Prevalensi infeksi nematoda pada babi sapih (49,61%, 64/129) lebih tinggi ($p<0,05$) dibandingkan fase menyusu (29,88%, 26/87). Koinfeksi nematoda pada anak babi ditemukan pada penelitian ini. Prevalensi infeksi nematoda pada anak babi cukup tinggi, terutama pada fase sapih, sehingga disarankan melakukan tindakan eradikasi nematoda sebelum anak babi disapih dan diulang setelah penyapihan.

Kata kunci: nematodiosis, prevalensi, *suckling pig, weaning pig*

INTRODUCTION

The Bali Province is a significant centre for pork production, with the pig population in Bali reaching 371,499 heads in 2022. In this context, Gianyar Regency accounted for 85,579 pigs (BPS, 2024). Pig farming in Bali has a long-standing tradition. Historically, pigs have been reared on a part-time basis or reserved for specific purposes, with their diet primarily consisting of kitchen scraps. However, pig farming has evolved into a primary occupation for many people. In Bali, pigs hold significant social and cultural importance within the community as they are integral to ceremonial and religious practices (Suarna & Suryani, 2015). Elevated pig populations can result in an increased incidence of nematodiosis, primarily due to the augmented availability of pig manure, which facilitates the proliferation of nematode populations as well as the increased risk of parasite infection in inadequately managed environments (Fischer et al., 2024).

Nematodiosis in pigs can impede nutrient absorption, leading to emaciation and mortality (Das et al., 2024). Young animals exhibit increased susceptibility to nematodiosis, primarily because of their underdeveloped immune systems. The clinical manifestations of nematodiosis in piglets include alopecia, lethargy, diarrhoea, emaciation, anaemia, and, in severe cases, mortality (Fausto et al., 2015). Some species of nematodes that infect piglets are *Trichuris suis, Ascaris suum, Globocephalus urosubulatus, Oesophangostomum dentatum, Hyostrongylus rubidus, Macracanthorhyncus hirudinaceus Gnathostoma hispidum, Bourgelatia diducta, Stephanurus dentatus,* and *Strongyloides ransomi* (Fendriyanto et al., 2015; Taylor et al., 2016).

Numerous studies have investigated the prevalence of nematodiosis in pigs in Bali. Research focusing on piglets sold in traditional markets within the regencies of Karangasem, Klungkung, Bangli, and Gianyar revealed a prevalence rate of gastrointestinal nematode infection in piglets of 71.6% (179/250) (Fendriyanto et al., 2015). Research conducted on the prevalence of *Ascaris suum* infection among pigs in the lowland regions of Bali Province revealed a prevalence rate of 18% (38/200) (Wiweka et al., 2020). Research on the prevalence of Trichuris suis and *Ascaris suum* infections in finisher pigs slaughtered at the Denpasar abattoir revealed prevalence rates of 5% (5/100) and 22% (22/100), respectively (Dwipayana et al., 2019; Suryani et al., 2018). Furthermore, a study investigating the prevalence of *Trichuris suis* infection among pigs reared at the Suwung landfill in Denpasar reported a prevalence rate of 55% (55/100) (Yoseph et al., 2018). While numerous studies have investigated the prevalence

of nematode infections in pigs in Bali, the majority have concentrated on adult pigs. Consequently, this study was conducted to ascertain the type and prevalence of gastrointestinal nematodes affecting piglets in the suckling and weaning phases on pig breeding farms in Gianyar Regency.

RESEARCH METHODS

Ethical Considerations for the Use of Experimental Animals

This study did not require ethical approval as it did not involve direct intervention or treatment of live animals. Fecal samples from piglets were collected noninvasively from all sub-districts in the Gianyar Regency, ensuring no stress or impact on the animals.

Object of Study

This study focused on piglets, with 216 fecal samples collected from these animals. The samples were categorized into two groups: 87 samples from piglets in the suckling phase, and 129 samples from piglets in the weaning phase. Sampling was conducted across 16 farms in seven sub-districts within the Gianyar Regency. The specific sampling sites included Blahbatuh (1 farm), Gianyar (2 farms), Payangan (4 farms), Sukawati (3 farms), Tampaksiring (1 farm), Tegallalang (4 farms), and Ubud (1 farm).

Research Design

This study employed an observational research design, using a cross-sectional approach. The sampling method utilised was purposive sampling, which involves selecting samples based on predetermined criteria. The criteria included the farm's location in the Gianyar Regency, the presence of piglets in the suckling and weaning phases, the confinement of pigs in pens, a farm population exceeding ten heads, and the inclusion of sows in the sampled farms.

Research Variables

The independent variables in this study were the piglet phase, specifically the weaning and suckling phases. The dependent variables were the prevalence and type of gastrointestinal nematode worms. The control variable consisted of piglets on pig breeding farms in Gianyar Regency.

Data Collection Methods

Data were collected by analysing piglet faeces using the saturated salt (NaCl) flotation method. Subsequently, the samples were examined under a microscope with a magnification of 100–400×. Worm eggs were identified based on their morphological characteristics as described by Zajac et al. (2012) dan Taylor et al. (2016).

Data Analysis

The prevalence of gastrointestinal nematode worm infections in piglets was determined by faecal examination. Prevalence was calculated using the formula: prevalence = (number of infected samples) / (number of all samples examined) × 100%. The data were presented descriptively in tables and graphs. A Chi-square ($\chi 2$) non-parametric test was conducted using the IBM SPSS Statistics 26 program to assess the difference in the prevalence of helminth infection between suckling and weaning phase piglets (Sampurna & Nindhia, 2018).

RESULTS AND DISCUSSION

Results

A total of 216 faecal samples from piglets were analysed, comprising 87 samples from

suckling-phase piglets and 129 from weaning-phase piglets. The findings indicated that the prevalence of gastrointestinal nematode infection in pig breeding farms within the Gianyar Regency was 41.66% (90/216). Specifically, the prevalence of nematodiosis in suckling phase piglets was 29.88% (26/87) and 49.61% (64/129), respectively (Table 1). Coprological identification of nematode eggs revealed that piglets in the Gianyar district were infected with *A. suum, T. suis, S. ransomi,* and strongyl-type worms (Figure 1). The prevalence rates for A. *suum, T. suis, S. ransomi*, and Strongyl-type worms in nursery piglets were 14.81% (32/216), 6.48% (14/216), 1.38% (3/216), and 33.33% (72/216), respectively. The prevalence of gastrointestinal nematodes is shown in Table 1.

The prevalence of nematode infections in weaning-phase piglets was significantly higher (p=0.004) than in suckling-phase piglets for *A. suum* (p=0.044), *T. suis* (p=0.009), and strongyl-type (p=0.003) infections. Furthermore, various nematode infections were identified in faecal samples from suckling- and weaning-phase piglets during faecal examination. The diversity of infections was classified based on the number of nematode species infecting the piglets (Figure 2). Single infections (32%) were more prevalent than double (6%) and triple (4 %) infections. Among single infections, strongyl-type worms were predominant (23.61%), while double infections were primarily a combination of *A. suum* and strongyl-type infections (4.62%). Triple infections were mainly a combination of *A. suum, T. suis*, and strongyl-type infections (3.7%) (Table 2).

Discussion

In this study, the prevalence of gastrointestinal nematode infection in piglets from pig-breeding farms in Gianyar Regency was 41.66%. This prevalence is lower than that reported by Das et al. (2024) in Tripura, India, at 59.09%, Fendriyanto et al. (2015)) in piglets in traditional markets in Bali at 71.6%, and Pinatih et al. (2024) in the Buleleng and Jemberana districts at 99.1%. The prevalence rate in Gianyar Regency can be attributed to the semi-intensive nature of pig farming in this area. Semi-intensive farming involves brick walls for enclosures, cement-plastered flooring, cement-based feeding and drinking facilities, and roofs composed of asbestos or zinc. Feed typically consists of a mixture of commercial feed, agricultural waste, and restaurant waste (Bebas & Gorda, 2022). In nursery pig farms located in Gianyar district, the cleaning or sanitisation processes are limited to physical cleaning with water, which primarily removes pig faeces. Consequently, there remains the potential for infective worm eggs and larvae to persist within the enclosures, posing a risk of infection to nursery piglets. Additionally, the irregular administration of deworming treatments using ivermectin, the continued use of cement mats in pens, and suboptimal management practices on these farms may further elevate the risk of gastrointestinal parasite infections.

The incidence of gastrointestinal nematode infection in suckling piglets (29.88%) was significantly lower ($p<0.05$) than that in weaned piglets (49.61%). The elevated prevalence in weaned piglets, compared to suckling piglets, may be attributed to the passive immunity conferred to suckling piglets through maternal colostrum, which is absent in weaned piglets. Furthermore, the stressors associated with weaning may compromise the immune system of piglets, rendering them more susceptible to infection by pathogenic agents (Upadhaya & Kim, 2021; Tang et al., 2022; Jenkins et al., 2024).

The prevalence of *A. suum* infection among piglets from breeding farms in Gianyar Regency was 14.81% in this study. Notably, the prevalence during the suckling phase (10.34%) was significantly lower ($p< 0.05$) than that during the weaning phase (17.82%). This prevalence rate is lower than the 18% reported by Wiweka et al. (2020) in the lowlands of the Bali Province. The reduced prevalence observed in the current study may be attributed to improved

farm management practices such as enhanced cage sanitation and regular cleaning. In contrast, the study by Wiweka et al. (2020) involved sampling from unsanitary cages, suggesting that inadequate husbandry management may contribute to higher prevalence rates.

The prevalence of *T. suis* infection among piglets in this study was 6.48%. Notably, the prevalence during the suckling phase was 1.14%, which was significantly lower ($p < 0.05$) than that during the weaning phase (10.07 %). This difference may be attributed to the fact that piglets in the weaning phase receive feed directly from farmers, thereby increasing the likelihood of oral infections. The prevalence reported in this study is considerably lower than that found in the study conducted byYoseph et al. (2018) at the Suwung landfill in Denpasar, where the prevalence among pigs aged less than six months was 56.8%. The elevated prevalence in the Suwung study could be attributed to suboptimal pig management practices, adverse environmental conditions, and the feeding of pigs with waste from the landfill (Yoseph et al., 2018).

The prevalence of *S. ransomi* infection among piglets in this study was 1.38%, with no cases observed during the suckling phase (0%). In contrast, the prevalence during the weaning phase was 2.32% ($p > 0.05$). These findings are consistent with those Kochanowski et al. (2017) reported in Poland, where the prevalence was 2%. However, the prevalence observed in this study was lower than that reported by Muliani et al. (2019) at the Suwung landfill in Denpasar, where the prevalence among pigs aged less than six months was 10.8%.

The prevalence of Strongyl-type helminth infection among piglets from breeding farms in Gianyar Regency was 33.33% in this study. Notably, the prevalence during the suckling phase (21.83%) was significantly lower ($p<0.05$) than that during the weaning phase (41.08%). This discrepancy may be attributed to oral infection from feed contaminated with infective helminth eggs and the extended pre-patent period of Strongyl-type helminths, which ranges from 32–42 days (Taylor et al., 2016). The observed prevalence was lower than that reported by Mariyana et al. (2020) in the lowlands of Bali Province (70.2 %) and by Fendriyanto et al. (2015) (57.6 %). This difference may be due to the fact that Fendriyanto et al. (2015) conducted their research on pigs aged 2-6 months, whereas the present study focused on suckling and weaning piglets. Several studies have suggested a correlation between pig age and Strongyl-type worm infection, indicating that older pigs exhibit a higher prevalence of Strongyl-type worm infections (Fendriyanto et al., 2015).

Variability in the prevalence of gastrointestinal nematode infections among piglets on breeding farms in Gianyar District was observed (Figure 2, Table 2). The diversity of infections was categorized based on the number of piglets infected with different nematode species. The findings indicated that single infections were predominantly caused by Strongyl-type nematodes (23.61%), whereas double infections were primarily co-infections of *A. suum* and Strongyl-type nematodes (4.62%). Triple infections mainly involved co-infections with *A. suum*, *T. suis*, and Strongyl-type nematodes (3.7%) (Table 2). The diversity of infections in this study exceeded that reported by Lee et al. (2022) in Korea, the prevalence of single infections was 12%, dominated by Strongyl-type nematodes, and double infections were 1%, involving co-infections with *A. suum* and Strongyl-type nematodes, with no triple infections reported. Conversely, the diversity of infections in this study was lower than that reported by Philip & Moradeyo (2022) in Nigeria, the prevalence of single, double, and triple infections was 70.2 %, 21.4%, and 8.4 %, respectively. However, this study did not specify the nematode species that dominated each infection category.

The limited diversity of nematode infections observed in Korea may be attributed to intensive farming practices and routine deworming protocols (Lee et al., 2022). In contrast, pig breeding

farms in Gianyar Regency operate under semi-intensive conditions, with irregular deworming practices. Similarly, the high diversity of gastrointestinal nematode infections in Nigeria is associated with semi-intensive farming systems, where inadequate farm management practices can elevate the risk of gastrointestinal parasite infection (Philip & Moradeyo, 2022). The farming conditions in Nigeria may closely resemble those in Gianyar, where semi-intensive operations, irregular deworming, and suboptimal management practices characterize the pig breeding farms. Piglets in such environments are susceptible to infections by multiple parasite species, a situation exacerbated by poor farm management, inadequate nutrition, compromised pig health, irregular deworming, and adverse environmental conditions (Nwafor et al., 2019; Philip & Moradeyo, 2022; Thanasuwan et al., 2024). Infections involving multiple parasite species in piglets can lead to growth retardation, lethargy, diarrhea, anemia, and death (Fausto et al., 2015;Limarta et al., 2024)

CONCLUSION AND SUGGESTION

Conclusion

Based on the findings of this study, it can be concluded that the prevalence of gastrointestinal nematode infections among piglets at pig breeding farms in Gianyar Regency was notably high, at 41.66% (90/216). The nematodes identified include *A. suum* at 14.81% (32/216), *T. suis* at 6.48% (14/216), *S. ransomi* at 1.38% (3/216), and Strongyl type at 33.33% (72/216), with the possibility of piglets being infected by multiple nematode species. The prevalence of nematodes in piglets during the suckling phase was 29.88% (26/216), which was significantly lower ($p < 0.05$) than that during the weaning phase, in which the prevalence was 49.61% (64/216).

Suggestion

Deworming of sows during the dry phase and piglets before weaning is essential and should be repeated post-weaning to prevent gastrointestinal nematode infections, thereby enhancing piglet fattening productivity. It is imperative to consider weaning management systems to mitigate stress in piglets, as stress can compromise their immune system. Further research is warranted to evaluate the efficacy of deworming piglets before and after weaning to reduce the occurrence of nematodiosis during fattening.

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Table

Table 1. Prevalence of gastrointestinal nematode infection in suckling and weaning pigs at pig breeding farms in Gianyar Regency.

Infection	Suckling pigs		Weaning pigs		Overall Prevalence		p value
	n	Prev (%)	n	Prev (%)	n	Prev (%)	
Nematode	26	29,88	64	49,61	90	41,66	0.004*
Ascaris suum	9	10,34	23	17,82	32	14,81	0,044*
Trichuris suis	1	1,14	13	10,07	14	6,48	0,009*
Strongyloides ransomi	0	0	3	2,32	3	1,38	0,152
Stongyl type	19	21,83	53	41,08	72	33,33	0,003*

Note: Prev: prevalence. n: number of positive samples. *Chi-square test results with $p < 0.05$ indicate a significant difference in prevalence.

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Table 2: Diversity of gastrointestinal nematode infections in breeding piglets at pig breeding farms in Gianyar Regency.

Nematode type	Sample positive (n)		Prevalence (%)		Overall Prevalence (%)
	Suckling	Weaning	Suckling	Weaning	
Strongyl type	16	35	18,39	27,13	23,61
Ascaris suum	6	6	6,89	4,65	5,55
Trichuris suis	1	3	1,14	2,32	1,85
Strongyloides ransomi	0	1	0,00	0,77	0,46
Ascaris suum + Strongyl type	3	7	3,44	5,42	4,62
Ascaris suum + *Trichuris suis*	0	1	0,00	0,77	0,46
Trichuris suis+ Strongyl type	0	1	0,00	0,77	0,46
Strongyloides ransomi+ Strongyl type	0	1	0,00	0,77	0,46
Ascaris suum + *Trichuris suis*+ Strongyl type	0	8	0,00	6,20	3,70
Ascaris suum + *Strongiloides ransomi* + Strongyl type	0	1	0,00	0,77	0,46

Figure

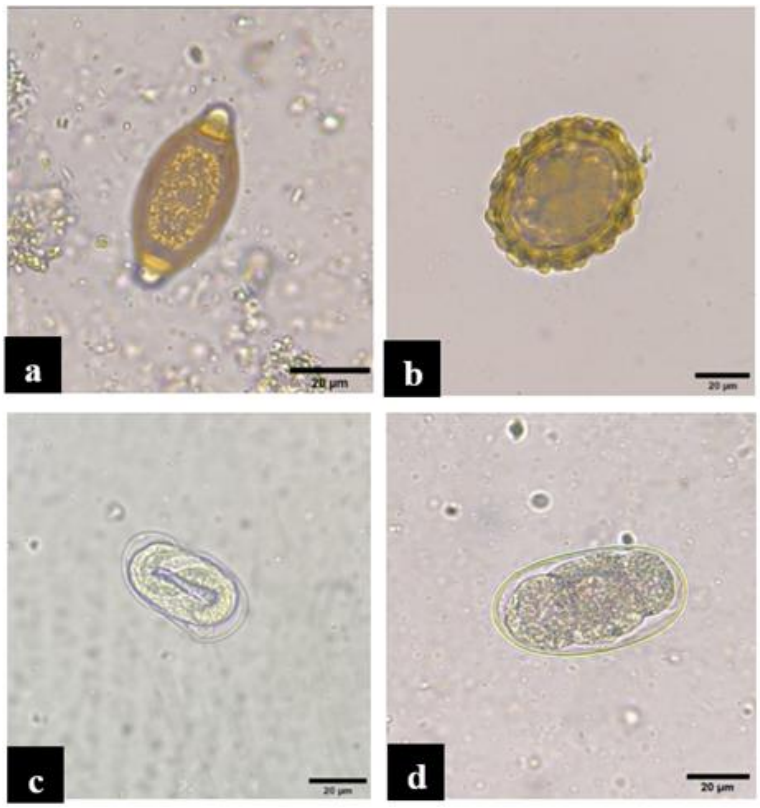

Figure 1. Identification of digestive tract nematode eggs of piglets, namely (a) *T. suis*, (b) *A. suum*, (c) *S. ransomi*, and (d) Strongyl type.

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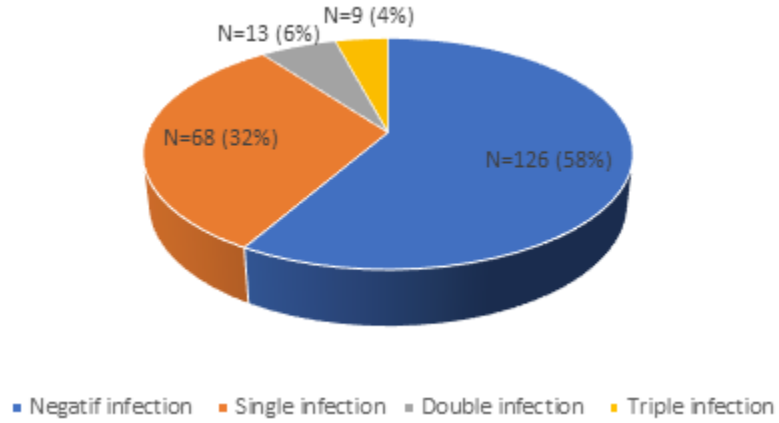

Figure 2. Diversity of gastrointestinal nematode infections in piglets on pig breeding farms in Gianyar Regency.