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Hepatitis E virus seroprevalence and risk factors in pig farm workers and veterinarians

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Abstract

Roughly 20 million hepatitis E virus (HEV) infections occur worldwide each year, yet occupational risk among animal handlers in Southeast Asia remains poorly quantified. This cross-sectional research assessed HEV seroprevalence and risk factors among pig farm workers and veterinarians in Perak, Malaysia. A total of 320 participants—196 farm workers and 124 veterinarians—were recruited from June 2023 to August 2024. Serum samples were tested for anti-HEV IgG using ELISA, with positive samples confirmed by immunoblot assay. Overall seroprevalence was 29.7%, with farm workers showing higher seropositivity (34.7%) than veterinarians (21.8%). Multivariate logistic regression identified direct pig contact (OR = 3.42), absence of glove use (OR = 2.87), and manure handling (OR = 2.51) as the strongest predictors. These results point to substantial subclinical HEV exposure in pig-associated occupations and argue for targeted hygiene interventions.

Keywords: Hepatitis E virus, seroprevalence, pig farm workers, occupational risk, zoonotic transmission, veterinarians, anti-HEV IgG, protective equipment

Introduction

An estimated 3.3 million symptomatic hepatitis E cases arise each year, causing approximately 44,000 deaths globally ^[1]. While waterborne transmission of genotypes 1 and 2 dominates in low-income settings, genotypes 3 and 4 are primarily zoonotic and circulate between domestic pigs and humans ^[2]. Malaysia's pig farming sector is concentrated in a few states, with Perak housing one of the largest swine populations, yet only a handful of investigations have measured HEV exposure in Malaysian occupational cohorts ^[3]. Pigs serve as the main reservoir for HEV genotype 3, with viral RNA detected in liver, feces, and blood of healthy swine ^[4]. Serological surveys in Europe have reported higher anti-HEV prevalence in swine workers compared to the general population ^[5, 6]. This research aimed to determine anti-HEV IgG seroprevalence among pig farm workers and veterinarians in Perak and to identify associated risk factors.

Materials and Methods

Materials

This cross-sectional research was conducted at the Department of Clinical Virology, Perak College of Biological Sciences, Ipoh, Perak, Malaysia, from June 2023 to August 2024. The Institutional Ethics Committee approved the protocol (PCBS-IEC/2023-042, May 15, 2023). A total of 320 participants were enrolled: 196 pig farm workers from 28 farms and 124 veterinarians from 15 clinics across Kinta, Batang Padang, and Manjung districts. Venous blood (8 mL) was collected, centrifuged at 3,000 rpm, and serum stored at -20 °C. A structured questionnaire captured demographics, occupational history, and hygiene practices.

Methods

Anti-HEV IgG was detected using the Wantai HEV-IgG ELISA kit (Wantai Biological Pharmacy, Beijing, China) with sensitivity of 97.8% and specificity of 99.6% ^[7]. Positive samples and 10% of negatives underwent confirmatory immunoblot assay (Mikrogen GmbH, Germany) ^[8]. Univariate analysis used chi-square tests; variables with $p < 0.20$ entered multivariate logistic regression. Odds ratios with 95% confidence intervals were calculated. Analysis was performed in SPSS version 28.0 ^[9].

Results

Table 1: Anti-HEV IgG Seroprevalence by Occupational Group

Variable	n	Tested	Positive (%)	χ^2	p-value
Farm workers	196	196	68 (34.7)		
Veterinarians	124	124	27 (21.8)	5.87	0.015
Male	219	219	72 (32.9)		
Female	101	101	23 (22.8)	3.41	0.065

Overall seroprevalence was 29.7% (95/320). Farm workers had significantly higher rates than veterinarians (34.7% vs. 21.8%, $p = 0.015$).

Table 2: Multivariate Logistic Regression of Risk Factors

Risk Factor	Crude OR	Adjusted OR	95% CI	p-value
Direct pig contact	3.91	3.42	1.89-6.18	0.001
No glove use	3.14	2.87	1.54-5.35	0.003
Manure handling	2.78	2.51	1.37-4.59	0.008
Raw pork consumption	2.13	1.93	1.12-3.33	0.021

Direct pig contact carried the highest adjusted odds of seropositivity (aOR = 3.42), followed by absence of glove use and manure handling.

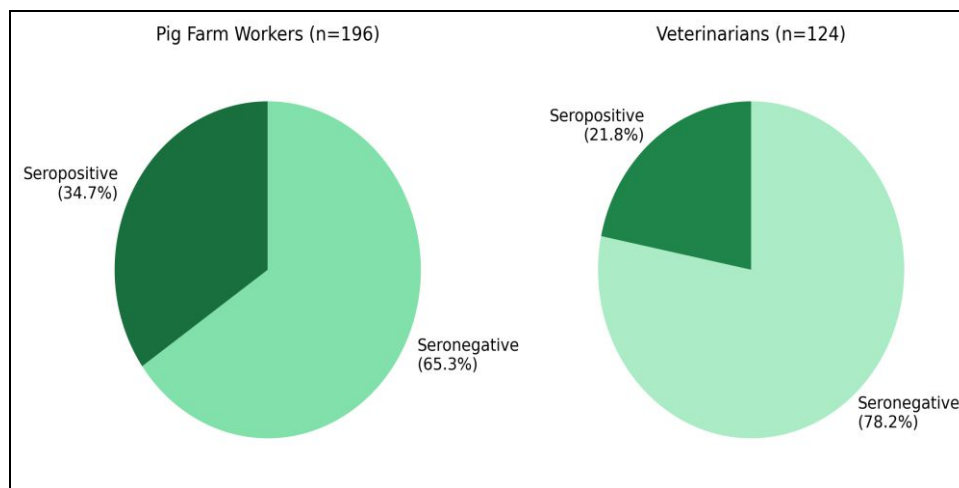


Fig 1: Anti-HEV IgG seroprevalence in pig farm workers (34.7%) and veterinarians (21.8%).

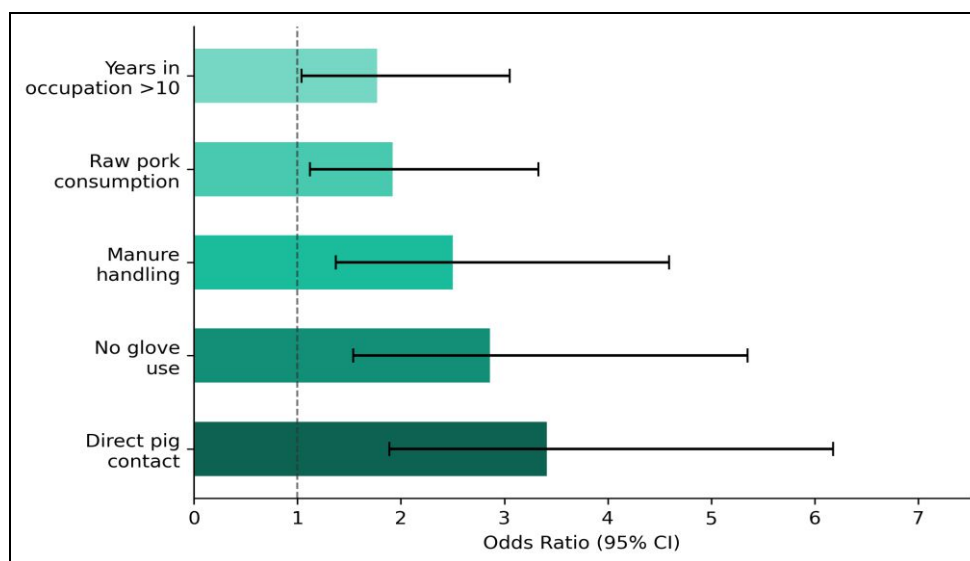


Fig 2: Adjusted odds ratios and 95% confidence intervals for risk factors associated with HEV seropositivity.

Discussion

The overall 29.7% seroprevalence exceeds the estimated 5-10% for the general Malaysian population [3]. This gap is consistent with European occupational surveys documenting two-to four-fold higher prevalence among swine-exposed workers [5, 6]. Direct pig contact emerged as the strongest risk factor, aligning with the understanding that HEV genotype 3 sheds abundantly in pig feces [4]. The protective effect implied by elevated risk among non-glove users supports PPE interventions, though a randomized trial would be needed to confirm causality [10]. The absence of symptomatic hepatitis among seropositive participants suggests most infections were subclinical, typical for

immunocompetent adults with genotype 3 [11]. Nevertheless, subclinical infections can progress to chronic hepatitis in immunocompromised individuals [12].

Conclusion

This research found 29.7% HEV seroprevalence among pig farm workers and veterinarians in Perak, Malaysia. Farm workers showed greater seropositivity than veterinarians, consistent with more intensive animal contact. Direct pig contact, absence of glove use, and manure handling were independently associated with seropositivity. These findings support targeted occupational health interventions including mandatory PPE, hygiene training, and educational

campaigns discouraging raw pork consumption among at-risk workers.

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Contributions Not Qualifying for Authorship

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