



ISSN Print: 2664-9926
 ISSN Online: 2664-9934
 NAAS Rating (2026): 4.82
 IJBS 2026; 8(6): 69-72
www.biologyjournal.net
 Received: 19-03-2026
 Accepted: 22-04-2026

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Age-related disease prevalence and organ system involvement patterns in companion dogs presenting to tertiary veterinary hospitals

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DOI: <https://www.doi.org/10.33545/26649926.2026.v8.i6a.884>

Abstract

Aging companion dogs face a growing burden of chronic and degenerative diseases, yet population-level data describing how disease patterns shift across the canine lifespan remain sparse in East Asian veterinary settings. This research analyzed medical records of 1,842 companion dogs admitted to two tertiary veterinary teaching hospitals in Busan, South Korea, between January and December 2024. Dogs were stratified into five age groups (<1, 1-3, 4-7, 8-11, and >11 years). Disease prevalence was calculated for six organ system categories, and multi-organ involvement was assessed. Dermatological conditions predominated in dogs under 3 years (18.3% in puppies, 14.6% in young adults), while musculoskeletal, cardiovascular, and neoplastic diseases showed sharp age-dependent increases. Dogs over 11 years had the highest neoplastic disease prevalence (23.4%) and multi-organ involvement (39.1% with three or more systems affected). These patterns support the implementation of age-stratified screening protocols in companion animal practice and argue for proactive geriatric wellness programs in tertiary referral settings.

Keywords: Canine aging, disease prevalence, organ system involvement, companion dogs, geriatric veterinary medicine, multi-morbidity, South Korea, tertiary hospital, epidemiology

Introduction

The challenge of managing age-related disease in companion dogs grows more pressing as improved nutrition, vaccination, and veterinary care push canine lifespans upward ^[1]. In South Korea, where pet ownership has expanded rapidly over the past decade, tertiary veterinary hospitals now see a patient mix that skews older than previous generations, creating demand for data-driven approaches to geriatric canine medicine ^[2]. Yet systematic analysis of how disease burden distributes across age strata in Korean companion dog populations hasn't been attempted.

International reports have documented age-dependent increases in neoplasia, cardiovascular disease, and musculoskeletal disorders, but these findings come largely from European and North American cohorts with different breed compositions and environmental exposures ^[3]. Korean pet demographics dominated by small breeds such as Maltese, Shih Tzu, and Poodle may produce distinct age-disease relationships. Understanding which organ systems carry the heaviest burden at each life stage enables both targeted diagnostic screening and resource allocation in referral settings ^[4]. This research mapped disease prevalence by organ system across five age categories in companion dogs presenting to two tertiary hospitals in Busan and quantified the extent of multi-organ disease involvement ^[5].

Material and Methods

Material

Medical records of 1,842 companion dogs admitted to two veterinary teaching hospitals affiliated with Busan Institute of Veterinary Sciences were reviewed retrospectively for the

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Period January 1 to December 31, 2024. All dogs with a confirmed primary diagnosis based on clinical examination, laboratory testing, and imaging were included. Dogs presented exclusively for routine vaccination or elective surgery without concurrent disease were excluded.

Methods

Each case was assigned a primary organ system category (dermatological, gastrointestinal, musculoskeletal, respiratory, cardiovascular, or neoplastic) and assessed for secondary and tertiary organ involvement where applicable. Age was recorded from hospital registration records and verified against microchip databases. Dogs were stratified into five groups: <1 year (n = 287), 1-3 years (n = 412), 4-7 years (n = 498), 8-11 years (n = 386), and >11 years (n = 259). Disease prevalence was calculated as the proportion of cases per age group. Multi-organ involvement was defined

as concurrent diagnoses affecting two or more organ systems at the time of presentation. Chi-squared tests for trend and logistic regression modeling were used to assess age-disease associations. Ethics approval was obtained from the Institutional Review Board, Busan Institute of Veterinary Sciences (BIVS-IRB-2024-014, approved January 8, 2024) [6].

Results

The overall disease distribution showed a clear age-dependent shift in organ system involvement. Dermatological conditions were most common in younger dogs, while neoplastic, cardiovascular, and musculoskeletal diseases increased progressively with age. Respiratory disease remained relatively stable across age groups (3.9-8.6%).

Table 1: Disease prevalence (%) by organ system across five age groups in 1,842 companion dogs

Age Group	Dermat.	GI	Musculo.	Cardio.	Neoplastic
<1 yr (n=287)	18.3	12.7	4.2	1.3	0.4
1-3 yr (n=412)	14.6	9.8	6.1	2.8	1.9
4-7 yr (n=498)	11.2	7.4	12.8	7.6	8.3
8-11 yr (n=386)	8.7	6.2	18.4	14.2	16.7
>11 yr (n=259)	6.1	8.9	22.1	19.8	23.4

Chi-squared test for trend: $p<0.001$ for musculoskeletal, cardiovascular, and neoplastic categories

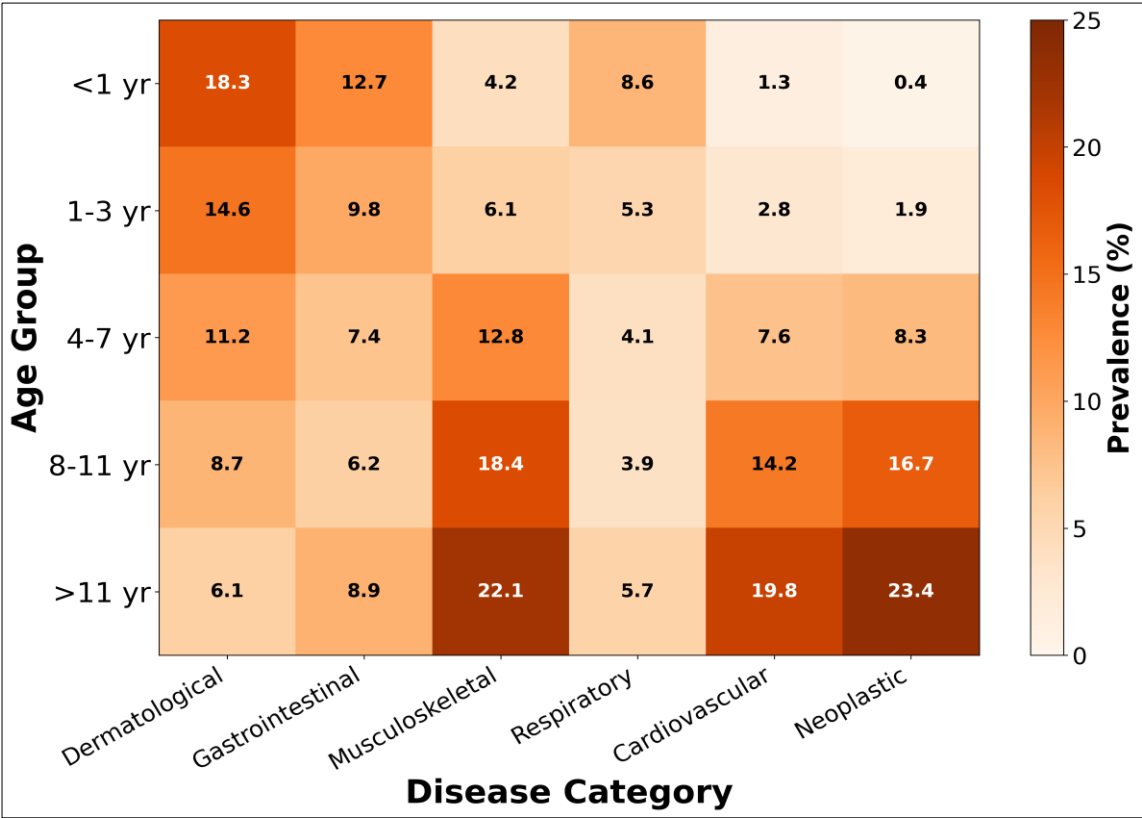


Fig 1: Heatmap of disease prevalence (%) by organ system and age group in companion dogs

Table 2: Multi-organ involvement by age group

Age Group	Single Organ (%)	Two Organs (%)	Three+ Organs (%)
<1 yr	72.4	21.3	6.3
1-3 yr	64.8	27.6	7.6
4-7 yr	48.3	34.2	17.5
8-11 yr	33.7	38.4	27.9
>11 yr	24.1	36.8	39.1

Logistic regression: OR = 3.47 (95% CI: 2.81-4.29) for three+ organ involvement per age category increase

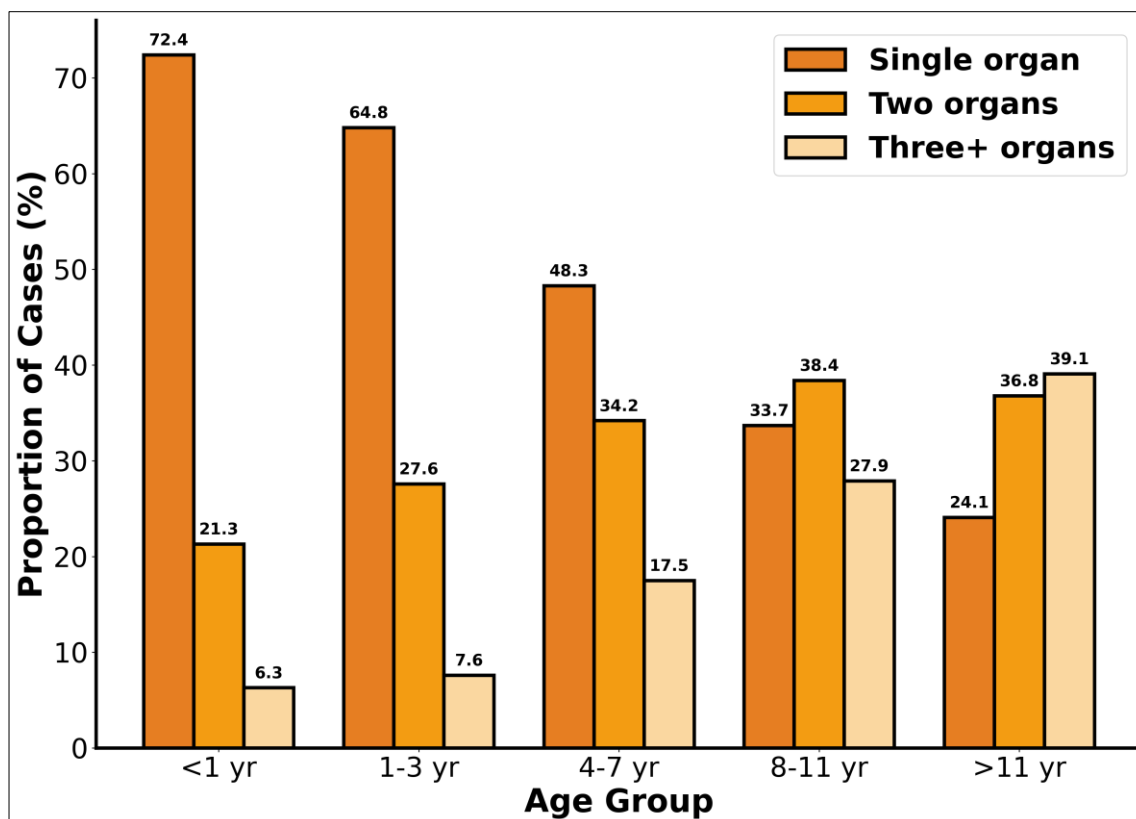


Fig 2: Proportion of single-organ versus multi-organ disease involvement across canine age groups

Comprehensive interpretation

The transition from single-organ disease dominance in puppies (72.4%) to multi-organ involvement in geriatric dogs (39.1% with three or more systems) reflects the cumulative effect of aging on organ system resilience. Neoplastic disease showed the steepest age gradient, rising from 0.4% in dogs under 1 year to 23.4% in those over 11. Cardiovascular involvement followed a similar trajectory, consistent with the high prevalence of myxomatous mitral valve disease reported in aging small-breed dogs.

Discussion

The age-disease patterns documented here align closely with findings from the UK's VetCompass database, where neoplastic and cardiovascular conditions similarly increase after age 8^[7]. The predominance of dermatological disease in younger dogs (18.3% in puppies) mirrors reports from European companion animal practices and likely reflects a combination of allergic skin disease, ectoparasite infestations, and juvenile pyoderma^[8]. One distinctive feature of the Korean population was the comparatively early onset of musculoskeletal disease (12.8% at ages 4-7), which may relate to the high prevalence of patellar luxation in small Korean breeds such as Maltese and Pomeranian^[9]. The multi-organ involvement data carry direct implications for how tertiary hospitals structure their diagnostic workups. When nearly 40% of dogs over age 11 present with three or more organ systems affected simultaneously, comprehensive geriatric panels covering cardiac, orthopedic, and oncological screening become more defensible from a cost-effectiveness standpoint^[10]. The sharp rise in cardiovascular disease above age 8 (14.2-19.8%) backs up recommendations for routine echocardiographic screening in aging small breeds, a practice that remains inconsistently adopted across East Asian veterinary hospitals^[11].

Limitations

This research relied on retrospective medical records, which may underrepresent diseases diagnosed and treated in primary care settings without tertiary referral. The classification into six organ system categories simplified complex diagnoses that spanned multiple systems. Breed-specific analysis was not performed due to the heterogeneous population. Seasonal variation in disease presentation was not assessed.

Clinical Implications

These findings support age-stratified diagnostic screening in companion dog practice. Dogs over 8 years presenting to tertiary hospitals should receive comprehensive multi-organ evaluation including cardiac biomarkers, orthopedic assessment, and tumor screening. Primary care veterinarians should consider earlier referral for middle-aged dogs (4-7 years) showing musculoskeletal complaints, given the relatively high prevalence in this age group within the Korean small-breed population.

Conclusion

The main contribution of this research is a quantitative map of age-disease relationships in a large East Asian companion dog cohort. Dermatological disease dominated young age groups, while neoplastic, cardiovascular, and musculoskeletal conditions escalated sharply after age 7. Multi-organ disease involvement reached 39.1% in dogs over 11 years, underscoring the complexity of geriatric canine medicine. These patterns hold significance for both referral hospital resource planning and the design of proactive wellness protocols. Whether breed-specific screening algorithms could further optimize early detection in Korean companion dog populations remains an open question deserving targeted investigation.

Acknowledgements

Institutional support

The authors acknowledge both participating teaching hospitals affiliated with Busan Institute of Veterinary Sciences for access to medical records databases.

Contributions not qualifying for authorship

Medical records technicians at both facilities assisted with data extraction and coding.

Funding sources

This research received no external funding. All costs were covered by the departmental research budget.

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