

## The incidence of gastroenteritis diagnosis among sick dogs presented to the Onderstepoort Veterinary Academic Hospital correlated with meteorological data

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### ABSTRACT

The number of sick dogs diagnosed with and without gastroenteritis presented to the Onderstepoort Veterinary Academic Hospital situated north of Pretoria is reported from counts extracted from the records of the Outpatients clinic for 6 years, 1988 to 1993. The average percentage of sick dogs diagnosed with gastroenteritis was 11.51 % and the average percentage of sick dogs that were admitted to the parvovirus isolation hospital ward was 2.8 %. A strong correlation exists between the number of dogs admitted to the parvovirus ward and average monthly wind speed and inverse humidity values.

**Key words:** canine parvovirus, gastroenteritis, humidity, incidence, wind speed.

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### INTRODUCTION

The term 'gastroenteritis' is used fairly loosely as a diagnosis in sick dogs presented to the Outpatients clinic at the Onderstepoort Veterinary Academic Hospital (OVAH) with signs of vomition or diarrhoea, or both. Many conditions can result in one or other of these clinical signs. The prevalence of these conditions varies. A common viral cause is canine parvovirus (CPV), which has various manifestations, from mild depression with loose, watery faeces and vomition, to peracute haemorrhagic diarrhoea<sup>1</sup>. This disease appears to wax and wane with the seasons. CPV can become life-threatening owing to dehydration, hypoproteinaemia, anaemia, hypovolaemic shock or any combination<sup>1</sup>. These cases require intensive treatment with appropriate replacement fluids and careful monitoring, and admission to a special isolation ward is recommended.

This report highlights the incidence of gastroenteritis diagnosed in sick dogs in the geographical area served by the OVAH and the percentage of those dogs that are admitted to the canine parvovirus isolation ward at the OVAH. To establish a possible correlation between the incidence of gastroenteritis and

certain meteorological data, mean monthly rainfall, maximum and minimum temperature, humidity and wind-speed seasonal fluctuations within the time period of the counts are statistically compared with the mean monthly gastroenteritis cases.

### MATERIALS AND METHODS

Records from the Outpatients clinic of the OVAH for the years 1988–1993 were analysed. Only sick dogs presented to the Outpatients clinic of OVAH were included in the counts. Routine vaccinations, elective surgical procedures such as castrations, ovariectomies and tail dockings and all referral cases were excluded from the counts. The majority of dogs came from an area that forms a semi-circle of roughly 30 km radius north of the Magaliesberg mountain range that bisects the north of Pretoria. Average monthly rainfall, maximum and minimum temperatures, humidity and wind-speed figures for the region were obtained from the Weather Bureau in Pretoria for the years 1988 to 1993. Linear regression and a Pearson's product moment correlation were determined for average monthly admitted gastroenteritis cases *versus* rainfall, maximum and minimum temperatures, wind speed, inverse humidity and a factor comprising wind speed × inverse humidity for the years 1988 to 1993 using the software programme Sigma Stat for

Windows Version 2.0 (Jandel Corporation). Statistical parameters were compared with their respective probability distributions to determine the probability of a chance occurrence. Probabilities were considered to be significant when *P* values were <0.05.

### RESULTS

Over the 6 years from 1988 to 1993 the total number of sick dogs presented to the Outpatients clinic at the OVAH has been fairly constant at c. 10 710 cases per year or c. 893 cases per month (Table 1). The average number of dogs diagnosed suffering from gastroenteritis was 1233 per year or 11.51 % of all sick dogs presented to the clinic. This is an average of 103 canine gastroenteritis cases per month, or just over 3 dogs per day with the condition (Table 1). An average of 299 dogs per year or 24.2 % of the above diagnosed gastroenteritis cases were classified as serious and subsequently admitted for more intensive treatment to the parvovirus isolation ward at OVAH. Of all sick dogs presented, c. 2.8 % per year are admitted to the parvovirus isolation ward. Unpublished data (H Griffin, Department of Physiology, Faculty of Veterinary Science, University of Pretoria, 1993) reveal that 71 % of patients admitted to the parvovirus isolation ward over a 4-month period from the beginning of August to the end of November 1993 tested positive for canine parvovirus. Of these 10 % subsequently died.

The results clearly demonstrate seasonal variation in the average monthly case load numbers for the 6 years 1988–1993, with a peak during the summer months from September to January and a trough during winter from May to July. The February drop in case numbers is due to the short month, as extending the period to 30 days would increase the average case count to 926. The average number of dogs diagnosed with gastroenteritis and those subsequently admitted to the parvovirus isolation ward also appears to be seasonal but in comparison to total case numbers is skewed to the left.

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Table 1: Average number of sick dogs, dogs diagnosed with gastroenteritis, dogs admitted to the parvovirus ward, rainfall, maximum and minimum temperatures, wind speed, inverse humidity and a combination of the last two values for the years 1988–1993.

Month	Number of sick dogs	Number of dogs diagnosed with gastroenteritis	Number of dogs admitted to parvovirus ward	Rainfall* (mm)	Maximum* temperature (°C)	Minimum* temperature (°C)	Wind speed (m/sec)	1/Humidity*	Wind speed × 1/humidity (m/sec)
	Mean (range)	Mean (range)	Mean (range)	Mean	Mean	Mean	Mean	Mean	Mean
January	1066 (960–1213)	133 (69–200)	24 (7–33)	97.5	29.5	18.4	1.36	1.78	2.42
February	837 (818–867)	58 (38–74)	13 (7–20)	93.9	28.5	17.9	1.20	1.67	2.00
March	903 (825–986)	60 (45–70)	15 (9–18)	87.6	27.4	16.5	1.04	1.69	1.76
April	824 (784–881)	72 (50–106)	15 (5–21)	53.6	25.0	13.2	0.83	1.77	1.47
May	772 (709–812)	72 (52–93)	19 (8–34)	1.02	23.1	8.8	0.84	1.98	1.66
June	804 (737–920)	85 (63–128)	23 (18–33)	12.3	19.7	5.5	0.97	1.95	1.89
July	798 (725–829)	83 (53–120)	21 (12–27)	1.4	20.6	5.5	1.04	2.16	2.25
August	859 (781–1013)	92 (60–126)	23 (18–26)	3.1	22.7	8.3	1.51	2.37	3.58
September	945 (848–1098)	150 (105–233)	46 (31–67)	12.7	26.7	12.7	1.73	2.60	4.50
October	1043 (948–1180)	168 (129–233)	40 (27–51)	68.4	27.1	15.1	1.84	2.05	3.77
November	977 (864–1082)	133 (96–150)	33 (21–56)	58.3	27.3	15.9	1.78	1.90	3.38
December	883 (765–970)	128 (90–195)	29 (15–36)	107.7	28.2	17.2	1.46	1.72	2.51
Total	10710 (10189–11027)	1233 (1067–1540)	299 (214–380)						
Month mean	893	103	25						

\*According to Weather Bureau, Irene.

The number of dogs admitted to the parvovirus isolation ward peaked acutely in September or early summer to an average of 46 cases per month. This is in comparison to a low of 13–15 cases per month in late summer (Fig. 1).

The OVAH lies in a summer rainfall area which records *c.* 600 mm rain per year<sup>2</sup>. Table 1 gives the average monthly rainfall, maximum and minimum temperatures, wind speed, inverse humidity and a factor comprising wind speed × inverse humidity for the same period as the gastroenteritis counts. Fig. 2 represents a plot of the average percentage monthly sick dogs admitted to the parvovirus hospital ward against the average monthly wind speed, inverse humidity and the factor comprising a combination of the last 2 values. These meteorological factors are closely correlated with the number of sick dogs admitted to the parvovirus ward, the strongest correlation of 0.837 with a probability value of 0.0007 being that factor that combines the effects of wind speed × inverse humidity. A multiple linear regression analysis whereby admitted gastroenteritis cases can be predicted from of linear combination of the above factor was determined:

$$\% \text{ Admitted gastroenteritis cases} = 0.594 + \frac{[0.831 \times \text{wind speed (m/sec)}]}{\% \text{ humidity}}$$

with  $P < 0.001$

Table 2 illustrates the correlation coefficients and probability distributions for the pairs of variables for percentage admitted canine gastroenteritis cases versus monthly rainfall, maximum and minimum temperature, wind speed, inverse

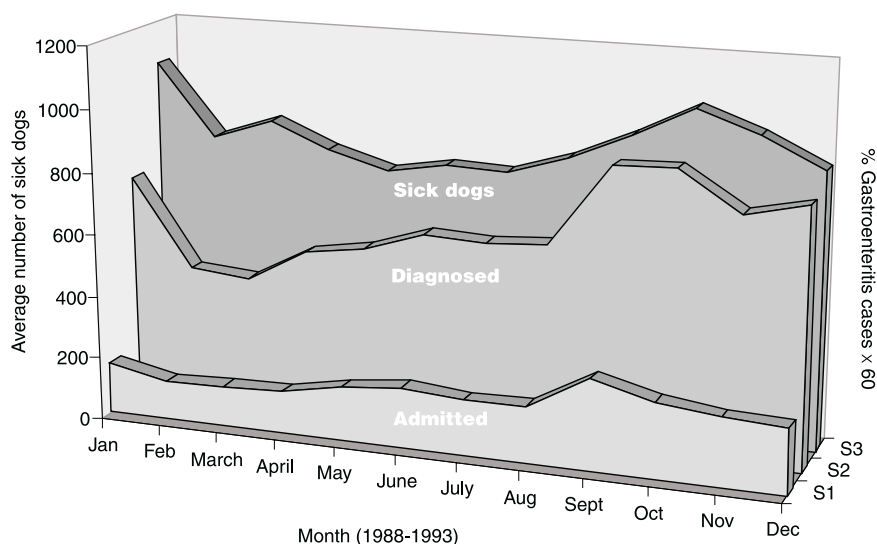


Fig. 1: Average number of sick dogs per month versus average percentage diagnosed and admitted gastroenteritis cases.

humidity and the factor comprising wind speed × inverse humidity figures for the 6 years included in the counts.

#### DISCUSSION

The seasonal variation in the case load of sick dogs presented to OVAH is clearly illustrated except for the slight drop in the summer peak in December. This may be due to the tendency for many South Africans to take annual leave during this period, in which case their dogs might be boarded at kennels or with friends located outside the area and or with their own veterinarians. Dogs that remain at home under caretaker supervision may not be as carefully monitored as before, or problems including transport and finance by the caretakers may play a role in the lower

number of sick dogs seen in December.

There is distinct seasonal variation in sick dogs diagnosed with gastroenteritis, which, if it followed the seasonal variation in case load numbers, would result in a constant or straight line graph with regard to percentage values of sick dogs with gastroenteritis. The percentage of sick dogs diagnosed with gastroenteritis and the percentage of sick dogs admitted to the parvovirus isolation ward do not remain constant and seem to lead the case load numbers by rapidly increasing and peaking in early summer with values of 16.11 % and 4.83 %, respectively, to lows of 6.63 % and 1.51 %, respectively, in late summer (Fig. 1).

It seems possible that the increase in dogs diagnosed with gastroenteritis

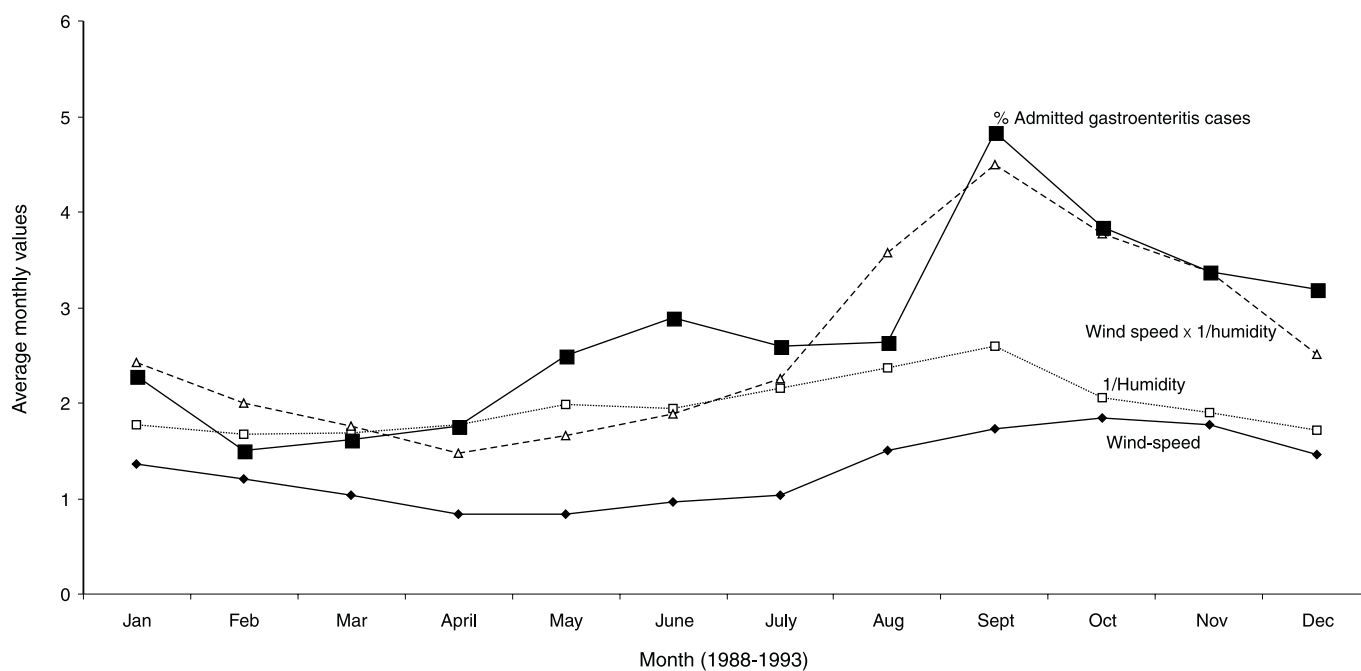


Fig.2: Average monthly percentage of dogs admitted with gastroenteritis versus average monthly wind speed (m/sec), inverse humidity and a combination of wind speed times inverse humidity.

Table 2: Pearson product moment correlation of percentage dogs admitted to the parvovirus hospital ward versus rainfall, maximum and minimum temperatures, wind speed, inverse humidity and a combination of the last two values.

Admitted gastroenteritis cases versus:	Rainfall	Maximum temperature	Minimum temperature	Wind speed	1/Humidity	Combination factor
Correlation coefficient	-0.294	0.00378	-0.115	0.721	0.700	0.837
P-value	0.354	0.991	0.723	0.0081	0.0113	0.00069

may be due to the harsh dry and windy conditions that enhance the susceptibility of mucous membranes to pathogen exposure and subsequent invasion. This hypothesis is strongly supported by the multiple linear regression formula that predicts the number of admitted gastroenteritis cases with a  $P < 0.001$  from a linear combination of wind speed  $\times$  inverse humidity, plus the almost identical graphs of the same 2 values.

Cost prohibits electron microscopical examination of all gastroenteritis cases believed to be due to canine parvovirus. However, the limited survey that was done suggests that c. 3.4 % of all sick dogs

presented to the Outpatients clinic in early summer are admitted with canine parvovirus. To reduce this flare-up of canine parvovirus, strategic planning of breeding to avoid having young pups during this period may be helpful, and the vaccination protocol may need to be modified for pups born at this time to give young, susceptible dogs better protection against the virus during this period.

The above figures illustrate that, despite vaccination regimes, gastroenteritis, and in particular canine parvovirus, is a major disease of domestic dogs in southern Africa. The syndrome causes, at best,

considerable veterinary expenditure and, at worst, suffering and loss of life.

#### ACKNOWLEDGEMENT

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