UNIVERSITI PUTRA MALAYSIA

A RETROSPECTIVE STUDY ON CASES OF EQUINE SKIN DISEASES REFERRED TO UNIVERSITY VETERINARY HOSPITAL (UVH), UPM FROM YEAR 2011 UNTIL 2015

BY

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NUR AIN BINTI MOHAMMAD AZMAN

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It is hereby certify that we have read this project paper entitled “A Retrospective Study on Cases of Equine Skin Diseases, Referred to UVH, UPM from Year 2011 until 2015”, by Nur Ain binti Mohammad Azman. In our opinion, it is satisfactory in terms of scope, quality and presentation as partial fulfilment of the requirement for the course VPD 4999- Project.

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DEDICATIONS

Especially for Mom and Dad.

Mom, for giving me a life to live, and love me unconditionally.

Dad, for giving me support and make me tougher from inside.

Thank you for making me who I am now.

Love you both.

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NUR AIN BINTI MOHAMMAD AZMAN

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LIST OF ABBREVIATIONS

I	Incidence
%	Percentage
PR	Prevalence
et al	abbr. Latin, et al (and others)
UVH	University Veterinary Hospital
UPM	Universiti Putra Malaysia

ABSTRAK

Abstrak daripada kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan asas VPD 4999 – Projek

KAJIAN RETROSPEKTIF TERHADAP PENYAKIT KULIT EKUIN YANG DILAPORKAN KE HOSPITAL VETERINAR UNIVERSITI (UVH), UNIVERSITI PUTRA MALAYSIA (UPM) DARI TAHUN 2011 HINGGA 2015

Oleh

Nur Ain binti Mohammad Azman

2016

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Satu kajian retrospektif berkenaan kes penyakit kulit pada ekuin yang dilaporkan ke Hospital Veterinar Universiti (UVH), Universiti Putra Malaysia (UPM) telah dijalankan dari tahun 2011 hingga 2015. Kajian ini memaparkankadar kelaziman dan kekerapan untuk pelbagai jenis penyakit kulit, dan menentukan hubungan antara kejadian penyakit dengan faktor yang menyumbang kepadanya, seperti jantina, baka, jenis pekerjaan, iklim dan pengagihan luka pada badan. Data berkenaan telah diperoleh dari buku log laporan kes ekuin di UVH, UPM. Sebanyak 666 kes penyakit kulit telah dikenalpasti daripada 3060 keseluruhan kes ekuin

sepanjang5 tahun. Purata kes penyakit kulit yang dilaporkan dalam 5 tahun adalah sebanyak 133 kes; dengan kelaziman sebanyak 25.19 % (tahun 2011), 24.04 % (tahun 2012), 21.04 % (tahun 2013), 17.41 % (tahun 2014) dan 21.52 % (tahun 2015). Penyakit kulit pada kuda tertinggi dilaporkan sebagai kecederaan trauma, diikuti oleh “dermatophilosis”, miasis kulit, alahan pada gigitan serangga, “dermatophytosis” dan penumbuhan tisu berlebihan. Tiada hubungan dikaitkan antara jantina dan baka dengan kejadian penyakit. Kuda yang digunakan untuk rekreasi mencatatkan jumlah tertinggi untuk penyakit kulit, dan sebahagian penyakit kulit terjadi samada pada musim panas atau musim hujan di Malaysia. Terdapat juga pola tertentu pada badan untuk pengagihan luka bagi sebahagian penyakit; walaupun kebanyakan darinya adalah umum.

Kata kunci: ekuin, penyakit kulit, kelaziman, kekerapan

ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD 4999- Project

A RETROSPECTIVE STUDY ON CASES OF EQUINE SKIN DISEASES REFERRED TO UNIVERSITY VETERINARY HOSPITAL (UVH), UPM FROM YEAR 2011 UNTIL 2015

By

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2016

Supervisor: Dr. Noraniza Mohd Adzahan

Co-Supervisors: Dr. Intan Shameha Abdul Razak, Prof. Dr. Mohamed Ariff Omar

A retrospective study on cases of equine skin diseases referred to University Veterinary Hospital (UVH), Universiti Putra Malaysia (UPM) from the year 2011 until 2015 was carried out. This study describes the incidence and prevalence rates for various types of skin diseases, and determines the relationship between disease occurrences with its contributing factors, which are the gender, breed, purpose of horse, climatic season and lesion distribution on body regions. Records were retrieved from equine case log book at UVH, UPM. A total of 666 skin cases were identified from a total of 3060 equine cases throughout the 5 years. Average cases of

equine cutaneous diseases reported within the 5 years period were 133 cases; with prevalence rates of 25.19 % (year 2011), 24.04% (year 2012), 21.04 % (year 2013), 17.41 % (year 2014) and 21.52 % (year 2015). The highest incidence of equine skin diseases was traumatic injuries, followed by dermatophilosis, cutaneous myiasis, insect bite hypersensitivity, dermatophytosis and exuberant granulation tissue. There was no relationship observed between sex and breed with disease distribution. Horses that were used for leisure riding showed the highest number of skin cases, and occurrence of certain skin diseases in horses were reported in either dry or wet season in Malaysia. There was also a characteristic pattern on lesion distribution on body regions for particular diseases; although most of them were generalized.

Keywords: equine, skin disease, incidence, prevalence

1.0 INTRODUCTION

Cutaneous diseases are the second major clinical cases reported to University Veterinary Hospital (UVH), Universiti Putra Malaysia (UPM) and potentially can cause a major impact to the equine industry. Although equine skin diseases and conditions are not serious and merely a cosmetic blemish that can be left untreated, some of the problems might affect the other body systems or worsens the underlying illnesses. Inokuma *et al*. (2003) stated that in their study that skin diseases of the horses found in a herd are usually caused by infection, nutritional deficiency or even poisoning. It is not only just skin-deep, and skin diseases can be indicative of a compromised immune system brought on by poor nutrition, age or other disease (Miller, 2016).

Based on Knottenbelt (2012), skin infections comprises of viral, bacterial, fungal, protozoal and parasitic diseases, whereas genetic or developmental skin disorders, allergic and immunologic diseases, traumatic skin injuries, skin diseases secondary to chemical poisoning and nutritional deficiency, cutaneous neoplasia, neurologic and endocrinologic conditions of the skin, iatrogenic causes, and even idiopathic skin damage are fall within the non- infectious causes.

In Malaysia, numerous skin diseases were reported in horses all around the country. Although it is reported all the time, a comprehensive study and investigation in equine dermatology was not documented. Therefore, this study was conducted to investigate the disease-causing factors, as well as preventive measures to avoid recurrence or disease turnover from an individual basis to a herd problem.

The objectives of this study are:

1. To investigate and identify the most common occurrence of equine skin diseases reported to University Veterinary Hospital (UVH) from year 2011 to 2015.
2. To investigate the predisposing factors related to the equine skin diseases.
3. To measure the incidence and prevalence rates of equine skin diseases reported to UVH from year 2011 to 2015.
4. To suggest suitable corrective and preventive measures to minimize skin diseases in horses.

2.0 LITERATURE REVIEW

Dermatology cases in horses are well divided into two categories; infectious and non-infectious diseases, with infectious cases comprising of bacterial, fungal, parasite and viral origin, whereas non-infectious cases are traumatic injuries, cutaneous neoplasia, skin allergy/hypersensitivity and miscellaneous (including proud flesh, maggot wound, inflammation, abscessation, hematoma and others).

2.1 Common equine skin diseases

Based on study made by Fauziah (2010), second major clinical problems occurred in horses were skin problems with traumatic injuries as the highest to be reported (19.6%), followed by insect bite hypersensitivity (4.47%), dermatophilosis (2.56%), proud flesh (1.38%), Queensland itch (1.12%) and habronemiasis (0.66%). Not only that, cutaneous neoplasms such as sarcoid, squamous cell carcinoma, melanoma, fibrosarcoma and cutaneous lymphosarcoma are also most commonly presented (Hewes and Sullins, 2009) with the incidence rate of equine sarcoid to be reported the most, ranging from 12.5 to 67.0 % of all neoplasms (Taylor and Haldorson, 2013).

2.2 Incidence of equine cutaneous diseases in relation to breed, sex and age

Only certain skin diseases suggest breed, sex and age predilection. Based on the study made by Taylor and Haldorson on equine sarcoid; Quarter Horses, Arabians and Appaloosas have an increased risk to develop the disease, thus

suggesting a breed predilection. Gelding is also reported to be commonly affected, while Standardbreds seems to have the least risk (Hewes and Sullins, 2009). However, Knottenbelt (2015) suggested that equine sarcoid may affects horses of all ages, types and colours without obvious gender predilection.

In cases of squamous cell carcinoma, Appaloosas, Paint Horses, Pintos and draft horses seem to be predisposed, but usually any breed or coat colour may also be affected; whereas melanomas are usually develop in aging grey horses, with Arabians, Thoroughbreds, Percherons and dappled horses that undergo depigmentation are mostly susceptible (Hewes and Sullins, 2009). In the same study, no breed or sex predilection in lymphosarcoma/ lymphoma was reported. However, most horses that develop the cutaneous form were between 4 to 9 years of age.

Dermatophytosis by *Trichophyton equinum* and *Microsporum canis* frequently cause "ringworm" in horses, especially in young animals (Cafarchia *et al*., 2013), and dermoid cysts are mostly identified in adult horses, although they are a congenital deformity of the hair follicles and glands (Knottenbelt, 2012).

2.3 Incidence of equine cutaneous diseases in relation to the season

Dermatophilosis is usually diagnosed during the fall and winter months (Anthony, 2015), corresponding to rainfall (White, 2005) with wet pastures and prolonged wetting of the skin become one of the most important predisposing factor that results in decreased resistance of the skin towards infection.

In another study, cases of insect bite hypersensitivity especially to *Culicoides spp* midges is commonly due to seasonal pruritus and *Habronema musca* (Habronemiasis) that is transmitted by Muscid flies also shows a very strong correlation of a seasonal pattern (Knottenbelt, 2012). That is the reason why it is also known as "summer sores".

2.4 Distribution of equine cutaneous diseases in relation to body region

Gross appearance of disease lesions and its distribution to body regions also plays a role in establishing a diagnosis. For an example, common locations for sarcoid development include the head (pinnae, periocular and lips), neck, extremities and ventral body surface (Taylor and Haldorson, 2013), whereas melanoma can usually be found on the ventral surface of the tail, perineal region and the external genitalia; although parotid region, neck and ears also can show presence of the disease (Hewes and Sullins, 2009). In the same study, squamous cell carcinoma are usually affects the mucocutaneous junction or external genitalia, with ocular and periocular lesion are most common.

Dorsal surface of horses are mostly affected in cases of dermatophilosis (Anthony, 2015). Occasionally, the lesions may involve the lower limbs when horses are kept in wet pastures or left in the stall while the stall is cleaned with high-pressure water hoses (White, 2005). In the other hand, as contaminated tack (bridles, saddle blankets and halters) often act as fomites in dermatophyte infections, lesions are usually appear first on the axillary/ girth area before progressing over the trunk, rump, neck, head and limbs (Anthony, 2015).

Other rare cases to be reported in Malaysia such as malasseziasis and sporotrichosis, distribution of lesions are usually between the mammary gland, perineum and ventral abdomen for the former and distal extremities for the latter one (White, 2005).

Finally in habronemiasis, lesion can be presented as non- healing ulcerated wounds that characteristically to be commonly found on the face; below the medial canthus of the eye (Knottenbelt, 2012).

3.0 MATERIALS AND METHODS

3.1 Medical records

This study was conducted retrospectively over 6 weeks on cases related to equine cutaneous diseases obtained from equine case log books in Large Animal Ward, UVH, UPM. Cases evaluated were from January 2011 until December 2015. Within this time period, a total of 666 cases of equine skin diseases were identified and recorded.

All cases leading to skin injuries and abnormalities were considered. These cases were then divided into two categories of diseases; infectious and non-infectious. Infectious diseases comprise of bacterial, parasite, virus and fungal origin, whereas non-infectious diseases include skin allergy/hypersensitivity, cutaneous neoplasia, traumatic injuries and miscellaneous (proud flesh, maggot wound, inflammation, abscessation, hematoma, saddle sore and anhidrosis). All cases that were taken into account were only from primary visit/complaint, and data collectedwere the case number, owner/place involved, patient signalments (age, sex and breed), the respective months of the year, lesion distribution on body regions and purpose of the horse. These data were then tabulated and further categorized as listed in Appendix I, Table 1.

3.2 Microsoft Excel 2013 and SPSS 20.0

All data were tabulated using Microsoft Excel 2013 according to disease categories, type of disease, breed, sex and purposeof the horse, respective months of occurrence and distribution of lesions on body region. Results were recorded and descriptive analysis was conducted using SPSS version 20.0.

4.0 RESULTS

4.1 Prevalence on cases of equine cutaneous diseases from 2011 until 2015

From a total of 3060 equine cases referred to UVH, UPM from the year 2011 until 2015, only 666 cases involved the integumentary system, comprising diseases and injuries. Average cases of equine cutaneous diseases reported within the period of 5 years were 133 cases, with highest number of cases in year 2011; 163 cases (25.19%), and lowest number of cases in year 2014 (Figure 1) with only 117 cases (17.41%) out of 672 (Appendix III, Table 5).

A total of 666 cases involving skin were further classified into type of diseases. In Figure 2 and 3, there were eight disease groups, categorized to infectious and non-infectious diseases. For "Infectious" category, bacterial infection were reported with the highest number of cases (48 cases; 1.57%), followed by fungal infection (39 cases; 1.27%), parasitic infestation (31 cases; 1.01%) and virus-induced tumour, with the least number of cases (4 cases; 0.13%) throughout the 5 year period.

For "Non-infectious" category, the highest number of cases was traumatic injuries with 278 cases (9.08%), followed by miscellaneous group with 141 cases (4.61%) and skin allergy/hypersensitivity (94 cases; 3.07%). Cutaneous neoplasia was ranked the last in non-infectious category with 31 cases (1.01%), but the second lowest in the total of eight groups; after virus-induced tumour (Appendix IV, Table 6).

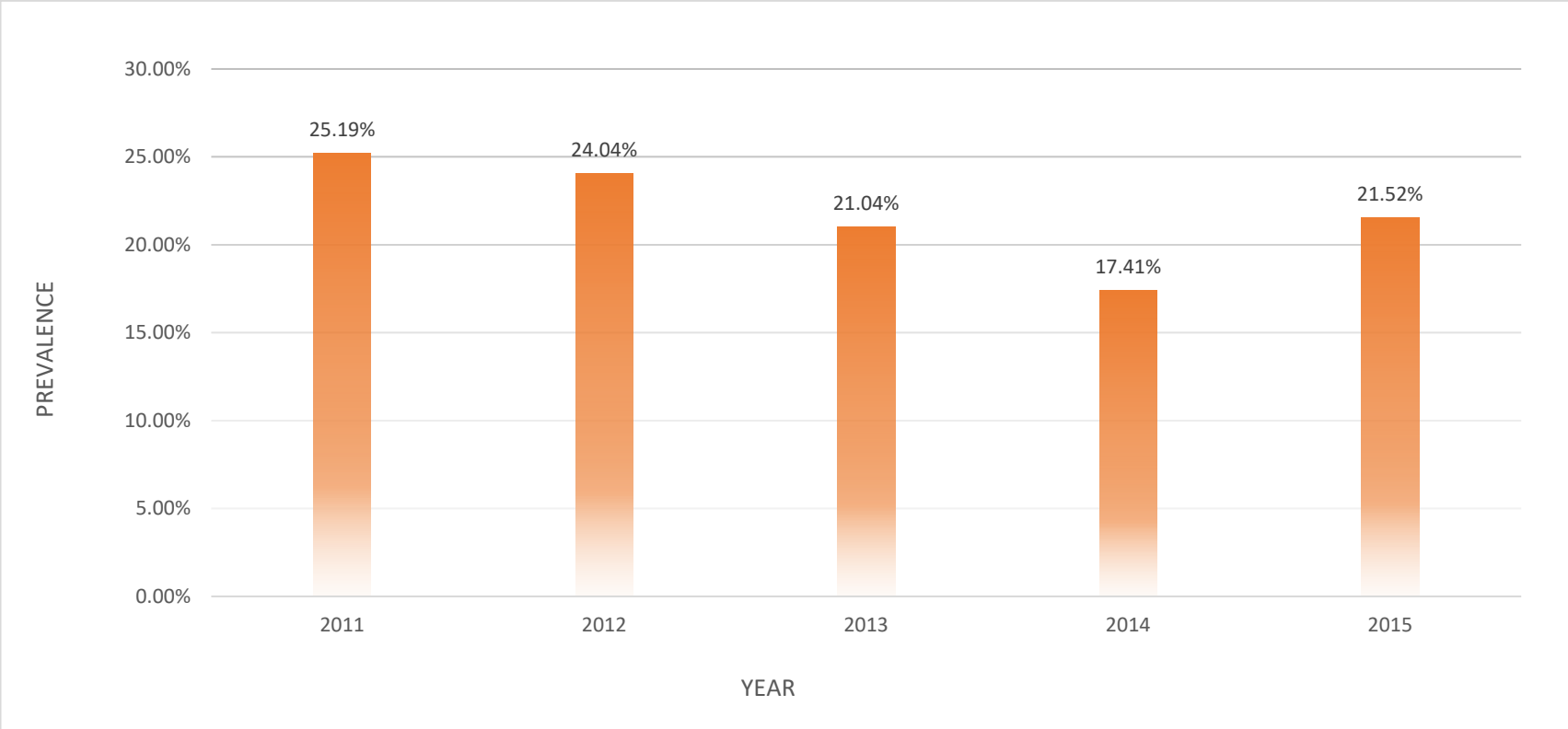

Figure 1: Prevalence on cases of equine cutaneous diseases in 5 years

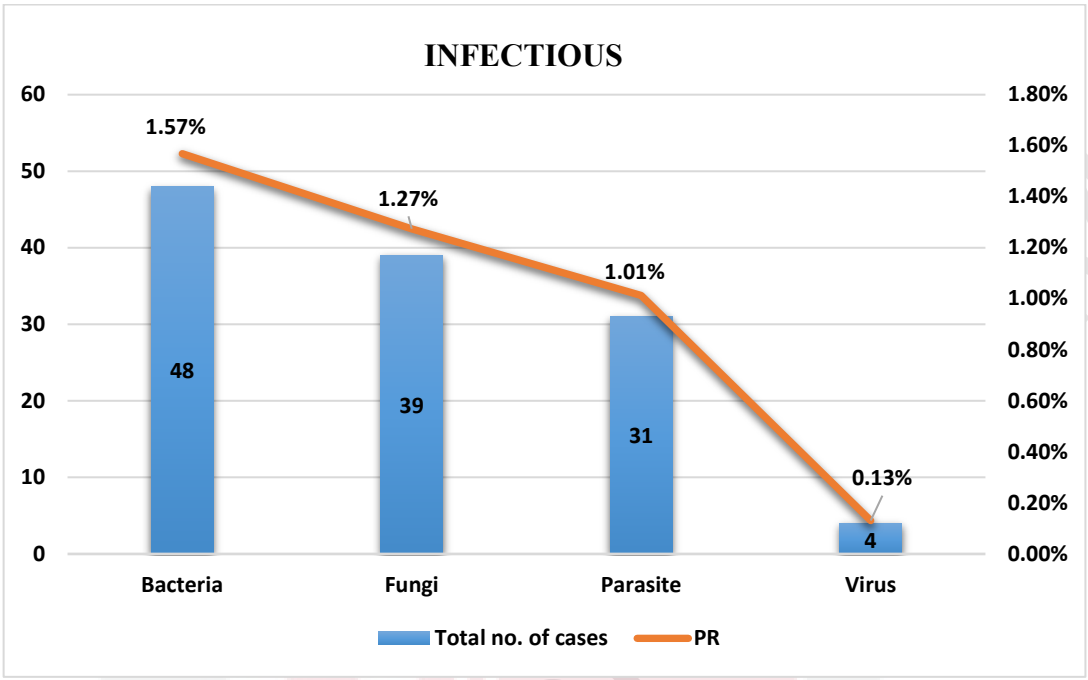

Figure 2: Prevalence of "infectious" skin diseases in 5 years

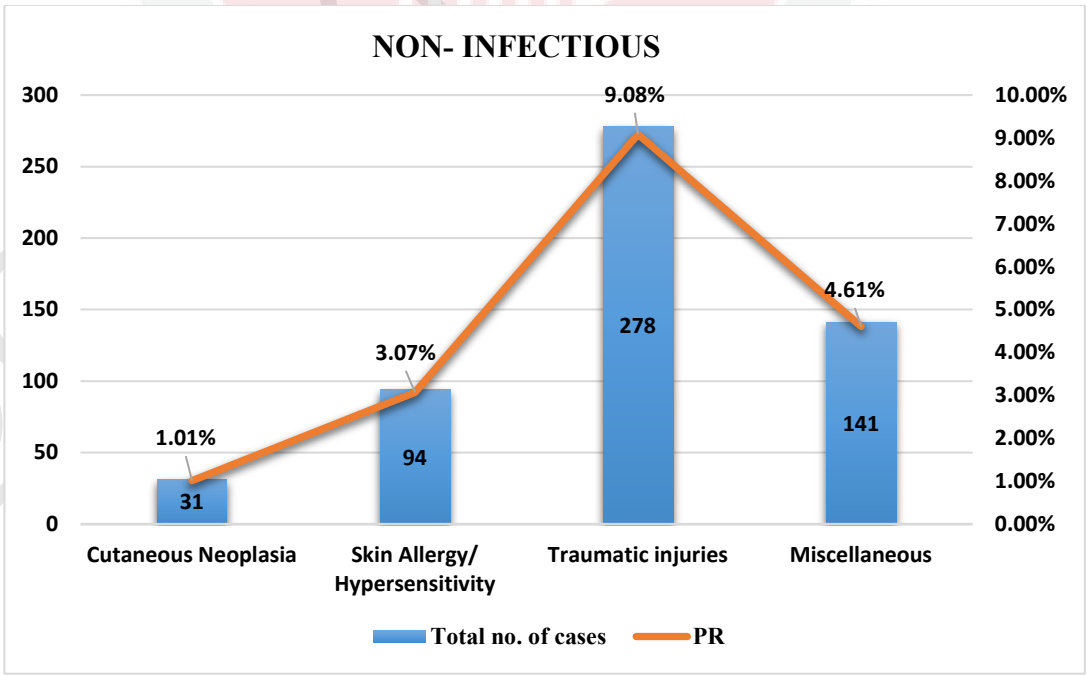

Figure 3: Prevalence of "non- infectious" skin diseases in 5 years

4.2 Incidence of equine skin diseases based on specific types of clinical conditions/ disease

The eight main disease groups were classified into its specific clinical conditions based on the diagnosis and laboratory reports. As shown in Table 4, there were 25 different specific clinical conditions with the highest incidence rate was traumatic injuries (278 cases; 41.74%) followed by dermatophilosis, under bacterial infection with 47 cases (7.06%) and cutaneous myiasis, under miscellaneous group with 44 cases (6.61%). Insect bite hypersensitivity was ranked the fourth with 40 cases (6.01%). Dermatophytosis, which was sub-grouping under fungal infection was the fifth highest, with frequency of 38 cases (5.71%) throughout the 5 years (Appendix II, Table 3).

4.3 Distribution of equine skin diseases in relation to sex

Sex of horses was classified into five main categories – stallion, gelding, mare, colt and filly (Figure 4). Gelding and mares were almost evenly distributed with a total number of 358 out of 666 cases (53.75%) for gelding and 240 out of 666 cases (36.04%) for mares. The incidence of equine skin diseases was decreased in colt and filly. There was 17 cases (2.55%) reported for colts and only 13 cutaneous cases (1.95%) for filly (Appendix V, Table 8).

Table 4: No. of cases and Incidence of Equine Skin Diseases with its specific clinical conditions/ disease type

DISEASE TYPE	No. of cases	Incidence (%)
Infectious		
Bacteria		
Dermatophilosis	47	7.06%
Staphylococcal infection	1	0.15%
Fungi		
Dermatophytosis	38	5.71%
Mucormycosis	1	0.15%
Parasite		
Cutaneous Habronemiasis	20	3.00%
Mange infestation	9	1.35%
Tick infestation	2	0.30%
Virus- Induced Tumour		
Equine Viral Papillomas	4	0.60%
Non- infectious		
Cutaneous Neoplasia		
Squamous Cell Carcinoma	7	1.05%
Mast Cell Tumour	2	0.30%
Mesenchymal Cell Tumour	0	0.00%
Sarcoid	12	1.80%
Melanoma	10	1.50%
Traumatic injuries		
Traumatic injuries	278	41.74%
Skin Allergy/ Hypersensitivity		
Insect bite hypersensitivity	40	6.01%
Sawdust hypersensitivity	8	1.20%
Queensland itch	21	3.15%
Atopic Dermatitis	8	1.20%
Allergy Contact Dermatitis	17	2.55%
Miscellaneous		
Abscessation	24	3.60%
Hematoma	7	1.05%
Exuberant Granulation Tissue	32	4.80%
Cutaneous Myiasis	44	6.61%
Pressure/ Saddle sore	14	2.10%
Dry Coat Syndrome	4	0.60%

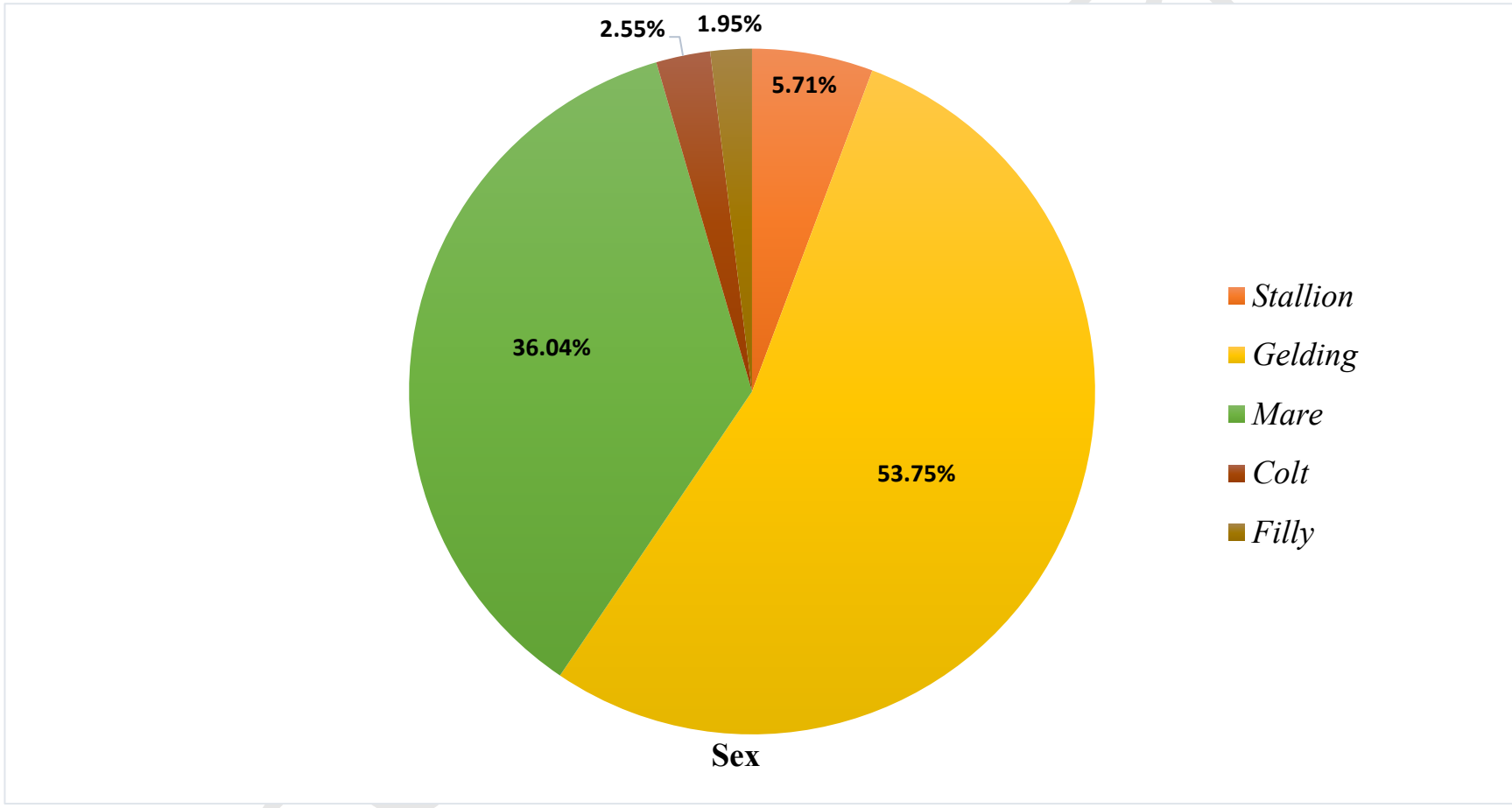

Figure 4: Incidence of equine skin diseases in relation to sex

4.4 Distribution of equine skin diseases in relation to purpose

As shown in Figure 5, out of 666 cases, horses that were used for leisure riding showed the highest incidence with a total of 349 (52.40%) cases, followed by patrol horses with 149 (22.37%) cases and endurance horses with 104 (15.62%) cases. Horses that were classified under "Others" include dressage, jumping, racing and carriage horses. Thirty-seven (5.56%) cases were recorded, followed by polo horses, with the least frequently reported at only 27 (4.05%) cases throughout the 5 years (Appendix IV, Table 10).

4.5 Distribution of equine skin diseases in relation to the breed

Figure 6 showed the distribution of equine skin disease with regards to the breed of horses. Out of 666 cases, only 638 cases were of known breed. The highest incidence was the Thoroughbred, with a total of 267 (40.09%) cases, followed by the Arabian/Arabian Cross with 198 (29.73%) cases. Polo Pony showed the lowest frequency with only 37 (5.56%) cases reported in 5 years. "Others" which include more than 5 horse breeds such as Warmblood, Friesien, Criollo, Quarter Horse, Ponies/Pony Cross and Donkeys were grouped together as these breeds were rarely reported. However, cumulative frequency showed a total number of 136 (20.42%) cases, which ranked as the second lowest incidence after the Polo Pony. Last 28 (4.20%) cases remain unidentifiable (See Appendix VII, Table 12).

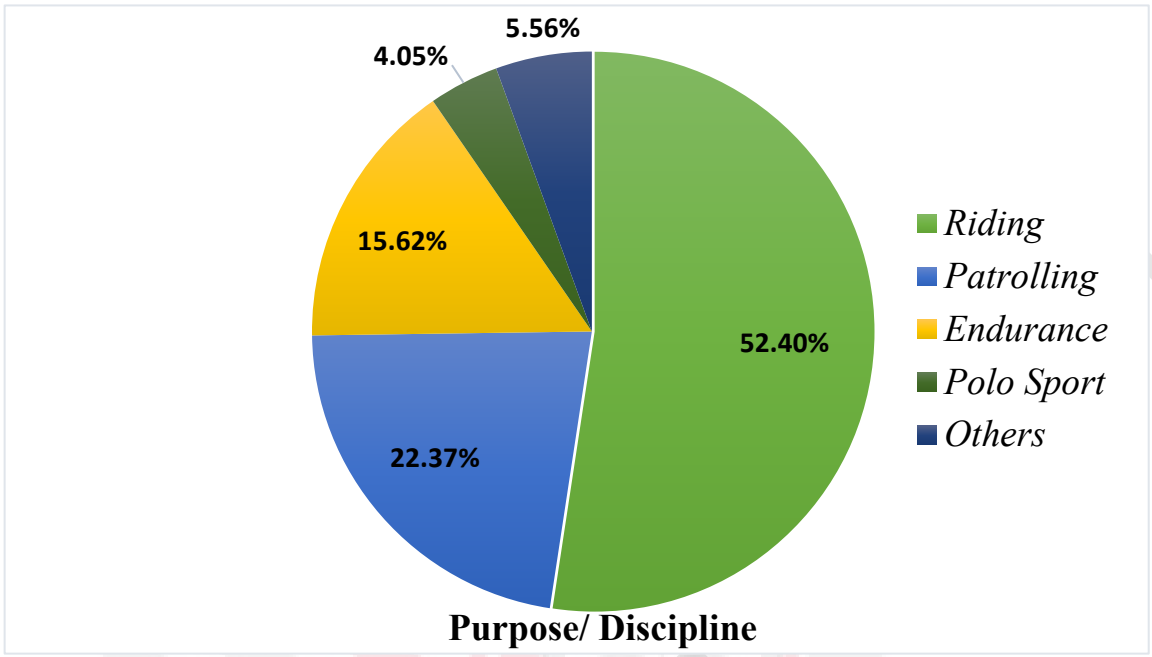

Figure 5: Incidence of equine skin diseases in relation to purpose/discipline

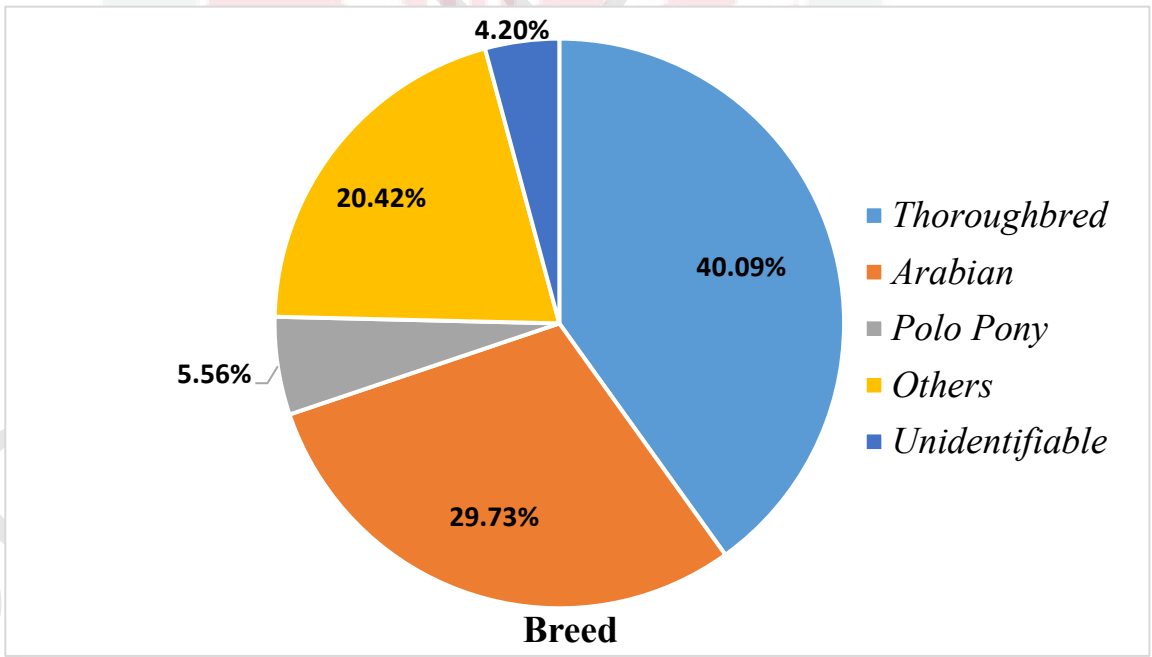

Figure 6: Incidence of equine skin diseases in relation to breed

4.6 Distribution of equine skin diseases in relation to months/season

A total of 666 cases of equine skin diseases were also divided based on months. Figure 7 showed the distribution of infectious cutaneous diseases in 12 months throughout the 5 years period. The highest number of bacterial cases was reported in November (8 cases), followed by October with 7 cases. Similarly, cases of fungal infection also showed the highest frequency in October with 6 cases and November, December and March; with a total of 5 cases respectively. Parasitic infestation in horses was commonly seen in May with 7 cases and no cases at all recorded for viral cases from January until September. Only 4 viral cases cumulatively, which occurred in October and November were referred to UVH throughout the 5 years (Appendix VIII, Table 13).

Non- infectious cutaneous diseases were also grouped into months. Figure 8 showed the distribution of cutaneous neoplasia, traumatic injuries and miscellaneous in 12 months. Cases of traumatic injuries were almost evenly distributed every months, except in September (34 cases), which reported the highest number of cases, and in January, February and April, which showed a decreased frequency of only 17, 16 and 18 cases respectively. Similarly to miscellaneous group, a range between 10 to 13 cases were reported every months, except a slight increment in the frequency in October (16 cases) and only 9 cases cumulatively reported in November. Cutaneous neoplasia showed the highest number of cases in May (Appendix VIII, Table 13).

Lastly, the distribution for “non-infectious” skin allergy/hypersensitivity cases was presented in Figure 9. The highest number of cases was reported in November with a total of 18 cases (Appendix VIII, Table 13).

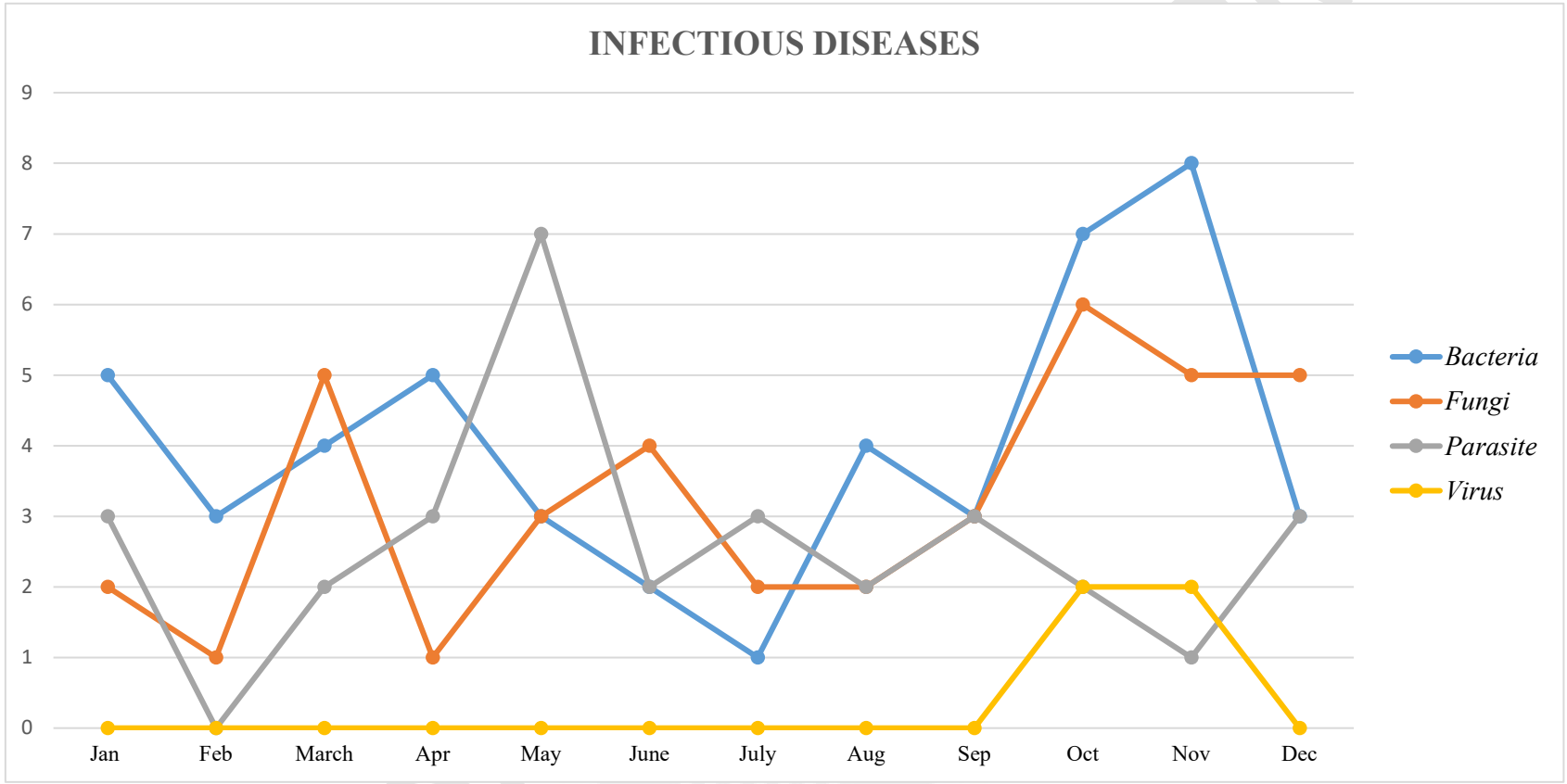

Figure 7: Distribution of "infectious" equine skin diseases in relation to months

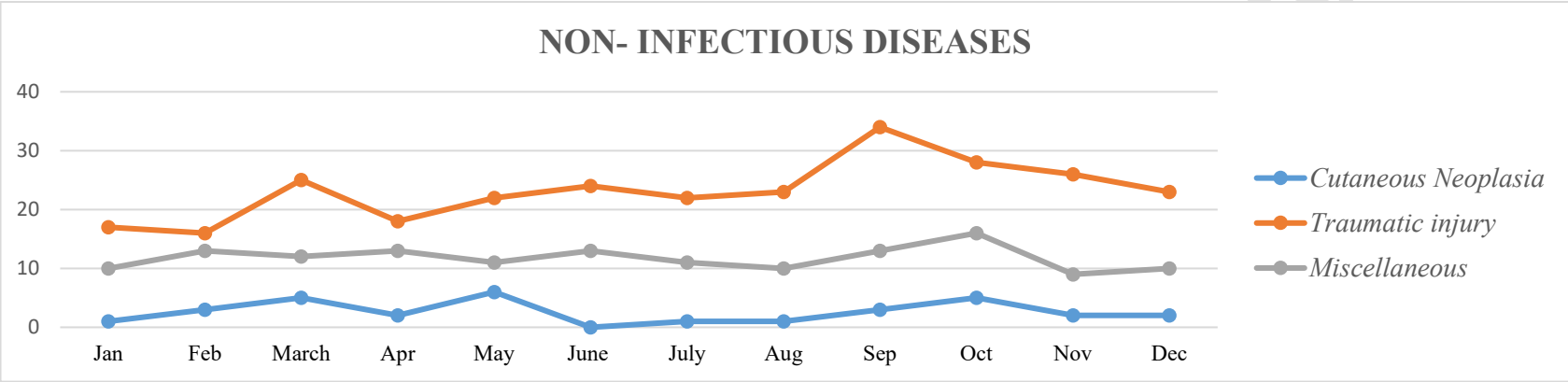

Figure 8: Distribution of "non-infectious" equine skin diseases in relation to months *(cutaneous neoplasia, traumatic injuries and miscellaneous)*

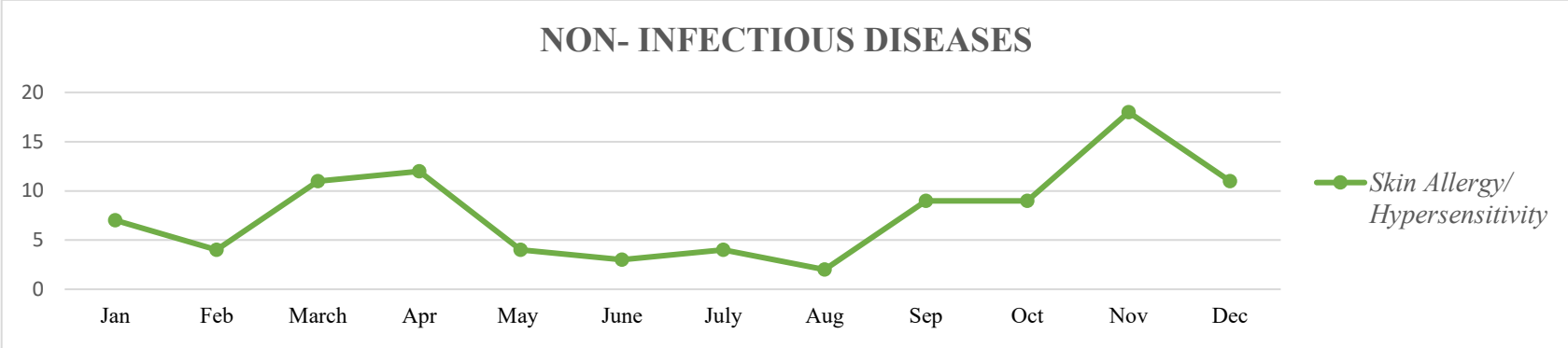

Figure 9: Distribution of "non- infectious" equine skin diseases in relation to months *(skin allergy/ hypersensitivity)*

4.7 Distribution of equine skin diseases in relation to body region

Out of 666 cases of equine skin diseases, 10 cases of each disease types were chosen randomly to determine the distribution of disease lesions(s) in relation to the body region. One particular horse may sustain more than one area of cutaneous lesions.

Bacterial cases, particularly dermatophilosis reported the highest incidence to be localized around the mane, neck and shoulder region at 31.25%, followed by thoraco-abdominal area (generalized) at 25.00%, and brisket region, tail base, back and rump with every each of these areas at 12.50%. Similarly in cases of dermatophytosis (fungal infection), the most common area to be affected were mane, neck, shoulder and thoraco-abdominal region, which was at 28.57%, followed by tail base, back and rump at 14.29%, facial area (9.52%) and chest (4.76%). Facial area, particularly periocular region showed the highest distribution at 58.33% in cases of parasitic infestation, especially cutaneous habronemiasis. Mane, neck and shoulder region each showed incidence at 16.67%, which corresponds to mange infestation, followed by thoraco- abdominal, chest and limbs region at 8.33% for both tick infestation and cutaneous habronemiasis. Only 4 out of 666 cases were reported for equine viral papillomas, and 40.00% distribution of lesions was reported to be around the tail base and facial region.

Equine cutaneous neoplasia showed the highest lesion distribution at 23.53% around the genital area, and 11.76% at the tail base. These lesions localization corresponds to 3 cases of melanoma being chosen randomly. Similarly, one out of 2 cases of equine sarcoid was reported to be developed around the genitalia, while the

latter showed a distribution of lesions around the brisket region. Skin allergy/hypersensitivity reported the highest incidence on the mane, neck and shoulder region at 37.50%, followed by along the dorsal midline, back and rump at 25.00% and 20.83% to be generalized. In cases of traumatic injuries, half of the chosen 10 cases (50.00%) were associated with limbs. For miscellaneous group, lesions were almost evenly distributed and showed no specific clinical localization (Appendix IX, Table 14).

5.0 DISCUSSION

The prevalence on cases of equine cutaneous diseases from year 2011 until 2015 showed a decrement pattern as the years were to be compared. The highest number of skin cases that reported to UVH, UPM was in 2011, with 163 (25.19%) from 647 cases. In contrast, the year 2014 reported the lowest number of cutaneous diseases which was only 117 cases (17.41%). Similarly in year 2015, only 119 cases (21.52%) were referred. However, total numbers of equine cases were 553, indirectly making the prevalence rate for the year 2015 to be quite high. A reduction in the number of skin cases throughout these 5 years can be suggestive that horse owners these days are well aware about the disease, thus inhibit the occurrences by improving the stable management, hygiene and pest control. Besides, this figure also might reflects the availability and growing number of private equine practitioners, which eventually causing more clients to seek for expertise nearby their places instead of reporting the disease to UVH.

The prevalence rate for each disease types was also measured. The highest prevalence rate was reported from traumatic injuries (9.08%), followed by miscellaneous (4.61%), skin allergy/hypersensitivity (3.07%) and bacterial infection (1.57%). Viral-induced tumour was ranked the last at only 0.13%. Each of the values were less than 10%. Thus reflects that cutaneous diseases were not the main concern in equine industry. Fauziah M. S. (2010) stated in her study that the highest number of equine cases to be reported was musculoskeletal problem (36.2%), followed by traumatic injuries (19.8%) and gastrointestinal problem (11.7%). Skin diseases were ranked the fifth with only 167 cases (11.0%) reported from 1521 cases in total.

Incidence of equine skin diseases among different sex in horses suggested that there is no relationship at all. Number of gelding and mares that were affected were almost evenly distributed with a total of 358 cases (53.75%) for gelding and 240 cases (36.04%) for mares. To compare, number of cases reported for stallion were only 38 cases (5.71%). These figures reflect that horse owners in Malaysia were convinced enough to gelding a stallion due to its behaviour and stallion were only raised for services and breeding purposes. Besides, no cases of infectious origin and skin allergy/hypersensitivity reported in colt and foal except for one case of fungal infection in a filly. However, age, sex and breed do not seem to affect host's susceptibility to infection (Karen, 2013). Malnutrition, intense rainfalls and mechanical traumas have been attributed to favour the disease development (OIE Terrestrial Manual, 2008).

The highest incidence of equine skin diseases based on horses' purpose and disciplines were horses that were used for leisure riding with a total of 349 cases (52.40%), followed by patrolling horses with 149 cases (22.37%) and endurance horses with 104 cases (15.62%). An average of 23 cases of infectious origin and 67 cases of skin allergy/hypersensitivity were reported under horses from riding schools and individual owners. These figures were indicative of poor stable management, nutrition and hygiene. This is consistent with studies done by Inokuma *et al.* (2003) that equine pyoderma cases were associated with malnutrition and unhygienic condition and probably due to neglect in a herd. Besides, traumatic injuries were ranked the first to occur among horses despite their purposes. Therefore, it is suggested that horses were more prone to traumatic injuries due to their athletic

nature and flight response, as well as because of the huge body conformation in relation to the limbs.

Based on breed, Thoroughbred reported the highest number of skin cases for both infectious and non-infectious categories, with a total of 267 cases (40.09%), followed by Arabian/Arabian Cross with 198 cases (29.73%) out of 666. This is suggestive that these two breeds were commonly being raised in Malaysia. Although some studies reported there is an association of particular equine cutaneous diseases with breed predilection, this study suggests no correlation at all between the two parameters.

The observation on the pattern of equine skin diseases in relation to the climatic season throughout these 5 years were also carried out. The number of bacterial and fungal cases was reported the highest at the end of the years, which was between October until December. This is consistent with studies done by White (2005) and Anthony (2015), which stated that dermatophilosis is usually diagnosed during the fall and winter months, corresponding to raining season. Wet pastures and prolonged wetting become the most predisposing factors that reduce the natural barriers of the integumentary system, thus allow the development of the disease. In contrast, parasitic infestation in horses was commonly seen in May with 7 cases, as to oppose with the other months which only reported about 1 to 3 cases of parasitic infestation in total. This corresponds to dry season. Knottenbelt (2012) showed that transmission of cutaneous habronemiasis was strongly correlated with seasonal pattern, especially in the spring and summer, with regression during the winter. In deeper, out of 20 cases of cutaneous habronemiasis that were reported to UVH in 5

years, twelve of them were referred during the dry seasons in Malaysia, theoretically between March until July. In the non-infectious group, skin allergy/hypersensitivity reported the highest number of cases in both driest and wettest month in Malaysia, which is during March, April, and November respectively. This is suggestive of proliferation of culicoides biting midges in these particular months, as well as production of allergenic pollens that might be a factor of disease occurrence.

Distribution of equine skin diseases in relation to body region was measured to determine the most favourable part/ area on the horses' body for the development of particular diseases. As one disease group might affects more than one area of body region, and one particular horse might sustain more than one lesion, 10 cases were selected randomly from each disease group to determine the percentage of disease distribution. Based on results, bacterial and fungal diseases were commonly reported to develop around the mane, neck and shoulder region, as well as on the thoraco- abdominal area; although brisket region, tail base, back and rump can also show presence of the disease. Parasitic infestation, particularly cutaneous habronemiasis showed the highest incidence (58.33%) on the periocular region. This is consistent with a study made by Knottenbelt (2012) that stated lesions of cutaneous habronemiasis were usually presented as non-healing ulcerative skin nodules, which is characteristically to be commonly found on the face; below the medial canthus of the eye. Sarcoid which is the most common equine cutaneous neoplasia to be reported to UVH with 12 out of 31 cases were commonly localized on the genitalia. This is consistent with the study made by Taylor and Haldorson (2013). While, in cases of melanoma, the highest lesion distribution were reported

around the genital area (23.53%) and tail base (11.76%). Therefore strongly consistent with statement by Hewes and Sullins (2009). Skin allergy/ hypersensitivity reported the highest incidence to develop on the mane, neck and shoulder region, as well as along the dorsal midline, back and rump. These areas were more to be exposed to flies, thus favoured the lesion development. In cases of allergy contact dermatitis, a contact with contaminated tack; especially saddle aids in the development of lesions along the dorsal midline.

In general, dermatophilosis and dermatophytosis were commonly being diagnosed in cases of bacterial and fungal infection respectively. The highest incidence of equine skin diseases was traumatic injuries with a total of 278 cases (41.74%), followed by dermatophilosis (7.06%), cutaneous myiasis (6.61%), insect bite hypersensitivity (6.01%), dermatophytosis (5.71%) and exuberant granulation tissue (4.80%). Sarcoid still ranked the first of all neoplasms with 12 (1.80%) cases, followed by melanoma (10 cases, 1.50%), squamous cell carcinoma (7 cases, 1.05%) and mast cell tumour (2 cases, 0.30%). Similar finding have been reported by Taylor and Haldorson (2013), which stated that incidence of equine sarcoid was reported the most, ranging from 12.5 to 67% of all neoplasms.

6.0 CONCLUSION AND RECOMMENDATIONS

In conclusion, the prevalence on cases of equine cutaneous diseases from the year 2011 until 2015 were significantly decreased with the highest number of cases reported to be in year 2011 (25.19%) and the lowest number was in year 2014 (17.41%). Out of 666 cases of equine skin diseases that were referred to UVH, traumatic injuries was the most frequently observed cases, followed by dermatophilosis, cutaneous myiasis, insect bite hypersensitivity, dermatophytosis and exuberant granulation tissue. There was no correlation at all between sex and breed in the distribution of equine skin diseases in Malaysia. However, there was a significant pattern on disease distribution in relation to the months. Most of bacterial, fungal, parasitic infestation and skin allergy/hypersensitivity cases were determined strongly by seasonal pattern. In the other hand, most of the development of disease lesions were characteristically localized in certain body regions. However, some of disease lesions were generalized. Thus affects more than one area of the integumentary system.

Although skin diseases/injuries in horses were merely a cosmetic blemish and not a major concern in equine industry, prevention on the development of diseases can be done by ensuring a proper stable management, hygiene and nutrition for the horses. Flies population in the stables can be controlled solely by fly repellent, and frequent grooming and bathing indeed aids in removing all the debris and disease-causing agents.

For future studies, other variables that might affect disease development should be delved into. These variables include colour predilection, treatment

regimes, as well as haematological and biochemical parameters. Besides, data recording for both age and breed of the horses should never be taken for granted. A proper record keeping of the patient in future might help in the establishment of proper disease diagnosis.

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APPENDIX I

Table 1: Number of cases of equine cutaneous diseases reported in 5 years based on categories of diseases

Category of Disease	2011	2012	2013	2014	2015	TOTAL
Infectious						
1) Bacteria	10	13	14	6	5	48
2) Fungi	5	7	12	7	8	39
3) Parasites	3	6	6	7	9	31
4) Viruses	1	2	0	0	1	4
Non- Infectious						
1) Traumatic injuries	80	58	41	49	50	278
2) Cutaneous Neoplasia	4	5	13	3	6	31
3) Skin Allergy/ Hypersensitivity	28	23	14	14	15	94
4) Miscellaneous	32	23	30	31	25	141
TOTAL	163	137	130	117	119	666

Table 2: Number of cases of equine cutaneous diseases reported in 5 years based on types of diseases

Infectious Diseases					
Types of Disease	2011	2012	2013	2014	2015
Bacteria					
Dermatophilosis	10	13	14	5	5
Staphylococcal infection	0	0	0	1	0
Fungi					
Dermatophytosis	5	7	11	7	8
Mucormycosis	0	0	1	0	0
Parasite					
Cutaneous habronemiasis	3	3	3	5	6
Mange infestation	0	2	3	2	2
Tick infestation	0	1	0	0	1
Virus- Induced Tumour					
Equine Viral Papillomas	1	2	0	0	1

Non- Infectious Diseases					
Types of Disease	2011	2012	2013	2014	2015
Cutaneous Neoplasia					
Squamous Cell Carcinoma	1	1	4	0	1
Mast Cell Tumour	0	1	1	0	0
Mesenchymal Cell Tumour	0	0	0	0	0
Sarcoid	2	1	4	1	4
Melanoma	1	2	4	2	1
Traumatic injuries					
Traumatic injuries	80	58	41	49	50
Miscellaneous					
Abscessation	7	2	7	4	4
Hematoma	1	2	1	1	2
Exuberant Granulation Tissue	3	7	8	9	5
Cutaneous Myiasis	11	5	6	14	8
Pressure/ Saddle sore	5	3	3	1	2
Dry Coat Syndrome	1	0	0	1	2
Inflammation	4	4	5	1	2
Allergy/ Hypersensitivity					
Insect bite hypersensitivity	14	12	5	4	5
Sawdust hypersensitivity	1	1	0	5	1
Queensland Itch	7	5	4	1	4
Atopic Dermatitis	2	2	0	3	1
Allergy Contact Dermatitis	4	3	5	1	4

APPENDIX II

Table 3: Number of cases and incidence of equine skin diseases based on categories of disease

Category of Disease	No. of cases	Incidence (%)
Infectious		
Bacteria	48	7.21
Fungi	39	5.86
Parasite	31	4.65
Virus	4	0.60
Non- Infectious		
Traumatic injury	278	41.74
Cutaneous Neoplasia	31	4.65
Skin Allergy/ Hypersensitivity	94	14.11
Miscellaneous	141	21.17

Table 4: Number of cases and incidence of equine skin diseases based on types of disease

Types of Disease	No. of cases	Incidence (%)
Infectious		
Bacteria		
Dermatophilosis	47	7.06
Staphylococcal infection	1	0.15
Fungi		
Dermatophytosis	38	5.71
Mucormycosis	1	0.15
Parasite		
Cutaneous Habronemiasis	20	3.00
Mange infestation	9	1.35
Tick infestation	2	0.30
Virus- Induced Tumour		
Equine Viral Papillomas	4	0.60
Non- infectious		
Cutaneous Neoplasia		
Squamous Cell Carcinoma	7	1.05
Mast Cell Tumour	2	0.30
Mesenchymal Cell Tumour	0	0.00
Sarcoid	12	1.80
Melanoma	10	1.50
Traumatic injuries		
Traumatic injuries	278	41.74
Skin Allergy/ Hypersensitivity		
Insect bite hypersensitivity	40	6.01
Sawdust hypersensitivity	8	1.20
Queensland Itch	21	3.15
Atopic Dermatitis	8	1.20
Allergy Contact Dermatitis	17	2.55
Miscellaneous		
Abscessation	24	3.60
Hematoma	7	1.05
Exuberant Granulation Tissue	32	4.80
Cutaneous Myiasis	44	6.61
Pressure/ Saddle sore	14	2.10
Dry Coat Syndrome	4	0.60
Inflammation	16	2.40

APPENDIX III

Table 5: Prevalence on cases of equine cutaneous diseases in 5 years

Year	Number of skin cases reported	Total number of cases reported	PR (%)
2011	163	647	25.19
2012	137	570	24.04
2013	130	618	21.04
2014	117	672	17.41
2015	119	553	21.52
Total	666	3060	21.76

APPENDIX IV

Table 6: Prevalence on cases of equine cutaneous diseases in 5 years based on category of disease

Category of Disease	Total number of cases	PR (%)
Infectious		
Bacteria	48	1.57
Fungi	39	1.27
Parasite	31	1.01
Virus	4	0.13
Non- Infectious		
Cutaneous Neoplasia	31	1.01
Skin Allergy/ Hypersensitivity	94	3.07
Traumatic injuries	278	9.08
Miscellaneous	141	4.61

APPENDIX V

Table 7: Number of cases of equine skin diseases based on sex

Category of Disease	Stallion	Gelding	Mare	Colt	Filly
Infectious					
Bacteria	2	30	14	0	0
Fungi	2	18	19	0	1
Parasite	3	6	21	0	0
Virus	0	3	1	0	0
Non- Infectious					
Cutaneous Neoplasia	4	19	7	1	0
Skin Allergy/ Hypersensitivity	1	43	50	0	0
Traumatic injuries	7	165	84	13	11
Miscellaneous	19	74	44	3	1

Table 8: Incidence of equine skin diseases based on sex

Sex	Number of cases	Incidence (%)
Stallion	38	5.71
Gelding	358	53.75
Mare	240	36.04
Colt	17	2.55
Filly	13	1.95

APPENDIX VI

Table 9: Number of cases of equine skin diseases based on purpose/discipline

Category of Disease	Riding	Patrolling	Endurance	Polo Sport	Others
Infectious					
Bacteria	27	9	8	1	3
Fungi	23	10	5	1	0
Parasite	20	3	4	1	3
Virus	0	1	3	0	0
Non-Infectious					
Cutaneous Neoplasia	18	7	5	1	0
Skin Allergy/ Hypersensitivity	67	18	4	3	2
Traumatic injuries	124	74	46	16	18
Miscellaneous	70	27	29	4	11

Others; include racing, jumping, dressage and carriage horses

Table 10: Incidence of equine skin diseases based on purpose/discipline

Purposes	Number of cases	Incidence (%)
Riding	349	52.40
Patrolling	149	22.37
Endurance	104	15.62
Polo Sport	27	4.05
Others	37	5.56

APPENDIX VII

Table 11: Number of cases of equine skin diseases based on breed

Category of Disease	Thoroughbred	Arabian	Polo Pony	Others	Unidentifiable
		Infectious			
Bacteria	27	12	2	7	0
Fungi	20	11	2	6	0
Parasite	11	9	2	9	0
Virus	1	3	0	0	0
		Non- Infectious			
Cutaneous Neoplasia	10	10	1	10	0
Skin Allergy/ Hypersensitivity	51	23	5	15	0
Traumatic injuries	101	75	20	54	28
Miscellaneous	46	55	5	35	0

Others; include Warmblood, Friesien, Criollo, Quarter Horse, Ponies/ Ponies (X), and Donkeys

Table 12: Incidence of equine skin diseases based on breed

Breed	Number of cases	Incidence (%)
Thoroughbred	267	40.09
Arabian	198	29.73
Polo Pony	37	5.56
Others	136	20.42
Unidentifiable	28	4.20

APPENDIX VIII

Table 13: Distribution of equine cutaneous diseases in relation to months/season

Skin Diseases	January	February	March	April	May	June	July	August	September	October	November	December
Infectious												
Bacteria	5	3	4	5	3	2	1	4	3	7	8	3
Fungi	2	1	5	1	3	4	2	2	3	6	5	5
Parasite	3	0	2	3	7	2	3	2	3	2	1	3
Virus	0	0	0	0	0	0	0	0	0	2	2	0
Non- Infectious												
Cutaneous Neoplasia	1	3	5	2	6	0	1	1	3	5	2	2
Skin Allergy/ Hypersensitivity	7	4	11	12	4	3	4	2	9	9	18	11
Traumatic injuries	17	16	25	18	22	24	22	23	34	28	26	23
Miscellaneous	10	13	12	13	11	13	11	10	13	16	9	10

APPENDIX IX

Table 14: Distribution of equine cutaneous diseases in relation to body region

Category of Disease	Type of Disease	Number of cases	Limbs	Mane, neck and shoulder	Chest	Generalized	Back and rump	Genital area	Tail base	Facial
				Infectious						
Bacteria	Dermatophilosis	10	0	5	2	4	2	0	2	1
Fungi	Dermatophytosis	10	0	6	1	6	3	0	3	2
Parasite	Cutaneous Habronemiasis	7	1	0	0	0	0	0	0	7
	Mange infestation	2	0	2	0	0	0	0	0	0
	Tick infestation	1	0	0	1	1	0	0	0	0
Virus	Equine Viral Papillomas	#4	0	0	0	1	0	0	2	2
				Non- Infectious						
Cutaneous Neoplasia	Melanoma	3	0	0	0	0	0	3	2	0
	Sarcoid	2	0	0	1	0	0	1	0	0
	Squamous Cell Carcinoma	4	2	1	1	0	1	0	0	3
	Mast Cell Tumour	1	0	1	1	0	0	0	0	0
Skin Allergy/ Hypersensitivity	Insect bite hypersensitivity	2	0	2	0	2	2	0	1	0
	Sawdust hypersensitivity	2	0	2	0	1	1	0	1	0
	Queensland Itch	2	0	2	1	1	1	0	0	0
	Atopic Dermatitis	2	0	2	0	1	1	0	1	0
	Allergy Contact Dermatitis	2	0	1	0	0	1	0	0	0
Traumatic Injury	*	10	5	1	0	0	1	0	0	3
Miscellaneous	Abscessation	1	1	0	0	0	0	0	0	0
	Hematoma	1	0	1	0	0	0	0	0	0
	Exuberant Granulation Tissue	2	1	1	0	0	0	0	0	0
	Cutaneous Myiasis	2	1	0	0	0	0	1	0	0
	Pressure/ Saddle sore	2	0	0	0	2	2	0	0	0
	Dry Coat Syndrome	1	0	0	0	1	0	0	0	0
	Inflammation	1	0	0	0	0	0	1	0	0

Table 15: Incidence of "infectious" equine skin diseases based on body regions per total of 10 randomly selected cases

Infectious								
Body Region	**Bacteria**	**I (%)**	**Fungi**	**I (%)**	**Parasite**	**I (%)**	**Virus**	**I (%)**
Limbs	0	0.00	0	0.00	1	8.33	0	0.00
Mane, Neck and Shoulder	5	31.25	6	28.57	2	16.67	0	0.00
Chest	2	12.50	1	4.76	1	8.33	0	0.00
Generalized	4	25.00	6	28.57	1	8.33	1	20.00
Back and rump	2	12.50	3	14.29	0	0.00	0	0.00
Genital area	0	0.00	0	0.00	0	0.00	0	0.00
Tail	2	12.50	3	14.29	0	0.00	2	40.00
Facial	1	6.25	2	9.52	7	58.33	2	40.00
Total	16		21		12		5	

Table 16: Incidence of "non-infectious" equine skin diseases based on body regions per total of 10 randomly selected cases

	Non-Infectious							
Body Regions	Skin Allergy/ Hypersensitivity	I (%)	Cutaneous Neoplasia	I (%)	Traumatic Injury	I (%)	Miscellaneous	I (%)
Limbs	0	0.00	2	11.76	5	50.00	3	25.00
Mane, Neck and Shoulder	9	37.50	2	11.76	1	10.00	2	16.67
Chest	1	4.17	3	17.65	0	0.00	0	0.00
Generalized	5	20.83	0	0.00	0	0.00	3	25.00
Back and rump	6	25.00	1	5.88	1	10.00	2	16.67
Genital area	0	0.00	4	23.53	0	0.00	2	16.67
Tail	3	12.50	2	11.76	0	0.00	0	0.00
Facial	0	0.00	3	17.65	3	30.00	0	0.00
Total	24		17		10		12	