

**Physical injuries and musculoskeletal disorders
(MSD) among veterinarians in Kerala: A study on
occupational risk factors**

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CERTIFICATE

Certified that the dissertation titled “Physical injuries and musculoskeletal disorders (MSD) among veterinarians in Kerala: A study on occupational risk factors” is a bonafide record of original research work undertaken by Dr. Govind Raveendran Pillai in partial fulfillment of the requirements for the award of the degree of ‘Master of Public Health’ under my guidance and supervision.

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DECLARATION

I declare that this dissertation entitled “Physical injuries and musculoskeletal disorders (MSD) among veterinarians in Kerala: A study on occupational risk factors” is my original research work. It has not been submitted to any other university or institution for the award of a degree. Information derived from the published or unpublished work of others have been duly acknowledged in the manuscript.

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GLOSSARY OF ABBREVIATIONS

AMCHSS	Achutha Menon Centre for Health Sciences Studies
CI	Confidence Interval
IVA	Indian Veterinary Association, Kerala
MSD	Musculoskeletal Disorder
MSD(PA and AW)	Musculoskeletal Disorders which Prevent normal Activities and cause Absence from Work
NIOSH	National Institute of Occupational Safety and Health, U.S
NMQ	Nordic Musculoskeletal Questionnaire
OR	Odds Ratio
SCTIMST	Sree Chitra Tirunal Institute for Medical Sciences and Technology
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
WHO	World Health Organisation

ABSTRACT

Introduction: Veterinarians are among a group of professionals who are highly susceptible to job related injuries and illnesses, due to their nature of work and the requirement of handling animals.

Objectives: To determine the types of physical injuries and musculoskeletal disorders (MSD) among veterinary practitioners in Kerala, the prevalence of these and to identify the occupational risk factors involved.

Methodology: The study consisted of a cross sectional survey among 180 randomly samples veterinarians from three districts of Kerala viz; Thiruvananthapuram, Thrissur and Alapuzha. The data collection tool used for this study is a self administered questionnaire.

Findings: The average response rate for the study was 72.0 percent. 52.5 percent of participants were reported to have suffered at least one work related, significant injury during the past one year. A significant injury was defined as the one that resulted in hospitalization or not being able to work for one day. 47.8 percent of participants suffered from musculoskeletal disorders (MSD) which prevented normal activities during last year. 33.9 percent were absent from work during the same period due to MSDs.

Conclusions: The prevalence of injuries and MSDs are relatively high among veterinary practitioners in Kerala, compared to those of many other countries, and also other comparable professional groups. Physically demanding work activities, standing, being uncertain/indecisive most often can contribute to the development of musculoskeletal disorders. Males and older age groups were found more likely to suffer a significant injury. Frequent use of restraining equipments was found to be a factor reducing injury. Access to restraining equipment would help to reduce injury and availability of trained assistance and protocols for treatment options would reduce the development and continued experience of MSD among veterinarians in Kerala.

INTRODUCTION

1.1 Background

A veterinarian is a practitioner of modern medicine who uses his or her skills and knowledge for the prevention and treatment of diseases, and wellbeing of animals, big and small. Such a professional would be called a veterinarian or ‘vet’ in North America and in many other parts of the world, while a physician who practices veterinary medicine would commonly be called a veterinary surgeon in UK and in many commonwealth countries. The different categories of veterinary practice include, but are not limited to, large/farm animal medicine, equine medicine, small/companion (pets) animal medicine, lab animal medicine and wild/zoo animal medicine. Apart from this, different specialities also exist in veterinary practice, such as surgery, dentistry, internal medicine, gynaecology, animal breeding etc.

Entry into veterinary profession requires extensive training, professional qualifications and registration with concerned governing bodies. Admission to veterinary schools is highly competitive and requires considerable preparation and academic merit. In many developed countries, majority of the new graduates entering this profession are women, which is remarkable due to the fact that this has been a male dominated field in its earlier days. In developing countries, although it is still a male dominated profession, there is an ever increasing trend of female veterinarians entering the field, which might ultimately culminate in the reversal of gender composition of this profession in the near future.

1.2 Veterinary practice in India

The veterinary sector in India is mainly concerned with livestock reared for dairy, meat and egg production. There are more than 300 million cattle and buffalos in this country, which is highest in the world.¹ The contribution of animal husbandry and dairying towards total gross domestic product (GDP) was 3.22 percent in 2008-09, which was about one third of the total agricultural output for that period.¹ India is one of the leading producer of milk in the world, second only to USA.¹ Most of the products from livestock are consumed domestically but exports have been steadily increasing in the past years. Dairying and livestock rearing constitute an important source of supplementary income to rural farmers and play a crucial role in rural economy. A lot of farmers are solely dependent on livestock rearing for their livelihood. Animal rearing is economically sustainable, providing a fairly stable income to poor farmers and is less susceptible abrupt changes in climatic conditions. Thus it acts as an insurance against catastrophes such as crop failures. Thus a veterinarian, in rural parts of the country, is not just a physician for animals, but also acts as a 'development agent' who is involved in the implementation of governmental schemes for poverty alleviation, employment generation, women's empowerment etc by promoting animal husbandry activities.

There are around 36000 veterinarians involved in livestock services and animal husbandry activities and are complemented by about 64500 animal health auxiliary personnel.² Each year about 2000 new graduates enter the profession from 25 veterinary colleges in India. The availability of veterinarians is distributed disproportionately across the country. The delivery of veterinary services to the rural small holder population is very weak.²

In the state of Kerala in India, most veterinarians have a mixed practice, i.e., they come across all kinds of animals in their everyday practice. In rural areas it is predominantly large animals and in cities, there are a higher proportion of dog and cat cases. There can be around 2000 registered vets who are actively involved in field practice in Kerala now.³ The majority are employed by the government, i.e. they work in the Dept of Animal Husbandry or Kerala Livestock Development Board. Rest of the vets are involved with co-operative or private sector, and a small minority is engaged in private practise.

1.3 Occupational health and safety in veterinary practice

Veterinarians are among a group of professionals who engage in activities which makes them highly susceptible to job related injuries and illnesses. As part of their job, they are exposed to risk of physical trauma in handling animals, high risk of zoonotic diseases (diseases acquired from animals), risk of disease from toxic substances and irritants, work related stress etc. Most of the veterinarians work in clinical settings, where they come across different types of animals, with wide diversity in their sizes, ranging from mice to elephants, which are often un-cooperative and unpredictable. The procedures done by veterinarians often induce discomfort to animals, which might result in aggressive behaviour. Receiving kicks, bites, scratches, needle stick injuries, sustaining falls, crushing, stamping on foot etc are part of everyday job. Vets often have to handle and manipulate body parts of very large animals, thus subjecting themselves to severe physical strain. These activities might predispose them to musculoskeletal disorders and other ailments. Many vets work outside their hospital/offices during most of their work day, and in rural areas, some have to travel long distances to deliver their services. Also, in these rural households or small farms, the provisions for safety precautions are often meagre. Another aspect of paramount concern is that of zoonotic

diseases. These diseases are transmitted naturally from animals to humans. More than 1,400 recognized human diseases are zoonotic and more than 70 % of emerging or re-emerging diseases have been originated from animals.⁴ Rabies, leptospirosis, tuberculosis, brucellosis, anthrax, Q fever are some of the few diseases belonging to a long list of infections veterinarians are constantly at the risk of acquiring as part of their job activities.

The gender profile of veterinarians is changing in favour of women in Kerala. The challenges faced by women veterinarians in a traditionally male dominated field may be quite demanding. They are especially at the threat of infections like brucellosis, toxoplasmosis etc which causes abortions and other reproductive problems. The short stature of women, when compared to men in general, might predispose them to higher rates of injury and musculoskeletal disorders, which needs further investigation.

Veterinarians often have to think about the economic consequences of their decisions regarding diagnostic and treatment options. They cannot force costly, unaffordable procedures on the owners of the animals since many poor farmers depend on the animals for their livelihood. These factors create an environment where reduction in cost of treatment is given priority and safety precautions take a back seat. The nature and diversity of their work create overwhelming challenges in the everyday lives of these professionals. The existing evidence in occupational health in this field is worthy of a detailed analysis to understand the true impact of work related health problems faced by veterinarians.

1.4. Chapterisation plan for the thesis

This chapter was indented to provide the background information regarding the work and work related health concerns of veterinarians. The following chapter attempts

to provide a detailed review of existing literature on this topic, particularly those regarding the physical injuries and musculoskeletal disorders among veterinarians. The third chapter details the objectives of this study and the procedures by which this research was conducted, such as selection of subjects, data collection analysis etc. The results of the analysis are described in subsequent chapter four. The last chapter consists of the discussion on the results and the conclusions derived. It also includes the strengths and limitations of the study.

REVIEW OF LITERATURE

2.1. Introduction

This review attempts to outline various aspects of work-related health risks and morbidity associated with veterinary practice, based on existing literature on this topic. A search of literature was conducted using internet search engines and databases, such as Google Scholar, Bing, PubMed database and Wiley online library. The key words used, in different combinations, were ‘occupational risk’, ‘veterinarian’, ‘veterinary practice’ ‘work related’, ‘injury’ ‘trauma’ and ‘musculoskeletal disorders’. The search was further expanded by snowballing through the citations in the available publications. Further information was obtained using personal communication with people who have undertaken studies in occupational health of veterinarians and associated fields. Out of 44 documents acquired and reviewed, 34 were published in peer reviewed journals and nine were published online at different websites. Among the peer reviewed publications, 22 were based on population based research done on veterinarians and other health professionals, 11 were reviews and 1 was an editorial. Among these documents, 29 were published after year 2000, out of which 15 were published after 2005. Four documents were published between 1990- 2000. Only one of the reviewed documents was published before 1990.

2.2. Occupational hazards associated with veterinary practice

Studies across a range of countries highlight the health hazards in occupations which involve dealing with animals. A major source of injury among agricultural workers

is livestock, and veterinarians share this exposure both in farm environments and in clinical practices.⁵ A study on work environment and occupational health of Finnish veterinarians reported that a veterinarian's work was physically demanding, and often involved an elevated risk of accidents. The highest risks occurred among veterinarians working in equine and bovine practice.^{6,7} In the same study, 73% of the veterinarians reported being very stressed.⁶

Jeyaretnam and Jones reviewed existing literature to identify major occupational hazards encountered by veterinarians in Australia. The hazards that veterinarians encounter may be classified into three categories, namely physical, chemical and biological.⁸ Physical hazards include physical trauma, motor vehicle accidents, radiation exposure, injuries caused by equipment and instruments, assault and drug abuse. Chemical hazards reported were anaesthetic gases, pesticides, chemotherapeutic agents, prostaglandins, formaldehyde, chemical injection from needle-stick injuries, drug abuse and suicide. Biological hazards were allergens, zoonotic diseases, mental and physical stress.⁸ Table 2.1 summarizes these findings.

Injuries accounted for the majority of adverse events related to veterinary practice. Professionals in this field are also subjected to musculoskeletal disorders (MSD) like shoulder pain, back pain, neck pain etc, which are cumulative type injuries, occurring after prolonged periods of exposure to the associated risk factors. Physical trauma and musculoskeletal disorders are discussed in detail in the subsequent sections of this review.

Any disease or infection that is naturally transmissible from vertebrate animals to humans and vice-versa is classified as a zoonosis or zoonotic disease. Diseases caused by

Table 2.1: Physical chemical and biological hazards in veterinary practice⁸

Physical	Chemical	Biological
1. Animal handling activities such as restraining, examining, lifting and moving animals 2. Handling equipments and instruments that might result in injury such as sharp objects like scalpels, needles etc 3. Ionizing radiation like X-rays 4. Handling (pulling, pushing, lifting etc) heavy objects 5. Motor vehicle accidents 6. Assault by disgruntled clients	1. Anaesthetic gases 2. Pesticides (Flea baths) 3. Chemotherapeutic agents 4. Foamaldehyde, Glutaraldehyde 5. X-ray developers 6. Methylated spirit 7. Prostaglandins and other hormonal products 8. Chemical injections from needle stick injuries 9. Chemical or pharmaceutical allergens/asthmogens 10. Irritants	1. Animal origin allergens 2. Ectoparasites 3. Zoonotic infections like rabies, tuberculosis, brucellosis, toxoplasmosis, salmonellosis, leptospirosis, Q fever, chlamydiosis, anthrax, Cat Scratch Fever, fungal skin diseases 4. Mental and physical stress 5. Carcinogenic zoonotic organisms 6. Auto inoculation with live bacteria/viruses (from live vaccines) 7. Suicide

Source: Adapted from Jeyaretnam and Jones⁸

zoonotic agents are not frequently observed among veterinarians, however many of them have the potential to cause very serious conditions.^{8,9} Gün et al investigated the prevalence of occupational infections among veterinarians in Turkey using serological analysis. This study found seropositivity for brucellosis and toxoplasmosis in a

significant number of subjects.¹⁰ Other studies have demonstrated the risk of infections acquired from animals and the need for infection control practices in veterinary clinics.^{11,12,13}

2.2.1. Physical injuries among veterinarians

Physical injuries are singular events causing trauma due to physical causes, which in most cases involve handling of animals. Landercasper et al, in one of the pioneering works in this field, described that trauma was the greatest cause of physical injury to veterinarians and their staff.¹⁴ They are at risk because, in their everyday job they have to pull, push and lift animals, some of which are very heavy and often uncooperative and sometimes with unpredictable temperament.⁸ A study of injury among Australian veterinarians reported that vets work closely with animals, often performing procedures that cause the animal pain or distress. Many of the animals that are treated are large, heavy and sometimes uncooperative, and are capable of biting, kicking or scratching in response to their handling.^{14,15} In addition, the treatment procedures are often performed using equipments like needles and sharps, thus further increasing the potential for serious injury.¹⁶ Veterinary profession is closely allied to healthcare, and thus veterinarians are also subjected to health hazards similar to healthcare workers.

2.2.1.1. Nature of injuries

The nature of injuries sustained on the job by veterinarians offers sufficient diversity to attempt to classify them into groups. Many researchers have tried this, using different criteria such as type of injury, mechanism of injury, source of injury, type of reporting, body part involved etc, as shown in Table 2.2^{6,7,8,14,15,17,18,19}

Table 2.2 Description of work related injuries among veterinarians

Source of injury	Dog, cat, horse, bovine animals, swine, lab animals, sharps etc
Mechanism of injury	Bites, scratches, kicks, contact, cutting with sharps, horn injury, stamping on foot, needle stick injuries, struck against, falls, contact with extreme temperature etc
Type of injuries	Cuts, wounds, lacerations, contusions, dislocation, sprain, strain, fractures etc
Body part involved	Hands, arm, knee, legs, neck, shoulder, face, head, chest etc
Type of reporting	Occurrence of injury during the past 1 month, past one year or ever in the whole veterinary career
Severity of injury	Injuries needing medical attention, hospitalization, absence from work for one or more days

Source: Reviewed publications. ^{6,7,8,14,15,17,18,19}

2.2.1.2. Assessment of injuries and associated exposures

There are many challenges in accurately assessing the magnitude of injuries sustained at work by veterinarians. One of them being the degree of severity, ranging from minor scratches or discomfort, to or injuries leading to amputation and permanent disability. Anyone intending to capture the burden of these injuries and the associated exposures must adequately define their level of significance. In a cross sectional survey of Australian veterinarians, Fritschi et al defined significant injury as one that resulted in hospitalization, or in not being able to work for one day, or in not being able to work at

the usual pace for 5 days.¹⁵ Shirangi et al, while investigating the prevalence of occupational exposures and protective practices in Australian female veterinarians, attempted to define the exposure level for X rays, anaesthetic gases and other exposures. The study subjects were classified as 'exposed' to anaesthetic gases if they reported doing one or more sessions of surgery per week, to X-rays if they reported taking one or more film per week. Those who reported any of these as rarely or never were classified as 'unexposed'.¹⁸ The necessity of grading and assessing injuries in such a manner can be dispensed with in case of studies based on data from insurance claims filed by injured veterinarians, as these are based on conditions that have already been diagnosed and reported. Nienhaus et al undertook such a research to understand the work-related accidents and occupational diseases in veterinarians and their staff in Germany.¹⁹ The results revealed an incidence rate for accidents in workplace as 105.4 per 1000 full time workers, which was 2.9 times higher than for general practitioners of human medicine. Two thirds of the reported accidents were due to scratches, bites or kicks from animals.¹⁹ The capability of research works based on insurance claims to uncover the actual burden of injuries and risk factors can be disputed due to the possibility of biases inherent to such type of reporting.

Studies reveal that veterinarians often sustain animal-related injuries, some of which may lead to hospitalisation or absence from work. The most costly injuries to veterinarians include strains and back injuries.⁸ More than half (51%) of veterinarians reported that they had sustained a significant work-related injury, as defined by Fritcshi et al, sometime during their career.¹⁵ More than a quarter of them (26%) reported having at least one injury in the immediately previous 12 months.¹⁵ Gabel and Gerberich conducted a case control study among veterinarians in Minnesota, probably the only one of its kind so far, and found out that bite punctures and lacerations, followed by sprains/strains,

needle puncture and crushing to be the most common traumatic injuries.²⁰ A study by Van Soest, et al observed that acute injuries were common among Australian veterinary nurses with majority of them being dog/cat bites/scratches, needle stick injuries and lacerations.¹⁷ Risk of needle stick injury is an inherent component of handling needles, which is a common activity in every day veterinary practice. Thus needle stick injuries are common occurrences among veterinary personnel, serious adverse events as a result of these, although uncommon, do take place.²¹

Hand was the most common part of the body involved in injuries, followed by limbs and face.^{7,19} Injuries to head and face constituted for about 15% of all injuries. Visits to hospital was needed in 47% of facial injuries with nearly half of them requiring admission.⁷

Risk factors that are found commonly associated with occupational injuries in veterinary profession are absence of adequate restraining devices for handling animals, absence of safety precautions, predominantly equine or large animal practice, inadequate assistance and fewer years of experience.^{7,8}

Self treatment and under reporting of injuries by veterinarians results in creating difficulties for effectively assessing the real health associated with this profession. Landercasper et al study revealed that 77% of veterinarians engaged in treating themselves. This includes self administration of antibiotics, suture of lacerations, reduction of fractures or dislocations.¹⁴

2.2.2. Musculoskeletal disorders in veterinarians

Worker Health Chart book 2004, National Institute of Occupational Safety and health (NIOSH) defines musculoskeletal disorder (MSD) as a condition or disorder that

involves the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs. These disorders are not typically the result of a distinctive, singular event, but are more gradual in their development. Thus, MSDs are cumulative-type injuries.²²

Different definitions for MSDs have been used for different purposes and by different organizations. Despite the differences, these definitions all share a common goal: to aggregate into one category a class of injuries and illnesses that have certain connections or commonalities.²³ Most definitions use a general description, usually of the parts of the body affected by MSDs. Occupational Safety and Health Definitions U.S. Bureau of Labour Statistics, defines MSDs as those which include cases where the nature of the injury or illness is sprains, strains, tears, back pain, hurt back, soreness, pain, hurt, except the back, carpal tunnel syndrome, hernia, or musculoskeletal system and connective tissue diseases and disorders, when the event or exposure leading to the injury or illness is bodily reaction/bending, climbing, crawling, reaching, twisting, over exertion or repetition.²³ A WHO booklet titled 'Preventing musculoskeletal disorders at work place' defines work related MSD as health problems of locomotor apparatus, i.e. of muscles, tendons, the skeleton, cartilage ligaments and nerves, which include all forms of ill health ranging from light, transitory disorders to irreversible, disabling injuries.²⁴

2.2.2.1. Method of assessment of musculoskeletal disorders

In the literature, various terms like musculoskeletal disorder,^{25,26} musculoskeletal discomfort,²⁷ musculoskeletal symptoms etc are used to compare musculoskeletal injury, pain, discomfort, symptoms, trouble, diseases and disorders. This creates confusion as diseases and disorders of musculoskeletal system usually require medical diagnosis. Many previous research works in this field have described that musculoskeletal disorders

(MSD) include musculoskeletal aches and pains which are self assessed^{23,28} and are precursors or symptoms to clinically defined events. These studies attempted to capture MSD as a description of symptoms like joint pains and aches and not as a substitute for a clinical description of any particular disease. A majority of estimation of MSD prevalence among veterinarians and other health care workers like dentists, nurses, physical therapists were done using a Nordic musculoskeletal questionnaire (NMQ) or one of its modified versions,^{25,26,27,28,29,30,31,32} which collected information about aches and pains of nine body sites- neck, shoulder, lower back, upper back, elbows, arms, wrists/hands, thighs, knees, ankles/feet. de Barros et al analysed the cross cultural adaptability of the Nordic style musculoskeletal questionnaire by translating and adapting into Brazilian Portuguese and found out that it offered substantial reliability.³³ In India, Gangopadhyay et al used NMQ to assess the prevalence of upper limb musculoskeletal disorders among brass metal workers in West Bengal.³⁴ It was also used to assess work-related musculoskeletal disorders among goldsmiths in Davangere district of Karnataka.³⁵

2.2.2.2. Risk factors for musculoskeletal disorders

Alisby in 1996 described a previously unreported syndrome in veterinarians doing repetitive multiple per-rectal examinations in large animals, characterized by persistent shoulder and neck pain. He attributed this to the injury of cervical plexus which could be a specific occupational syndrome made worse by repetitive strain.³⁶

Smith DR, et al studied the prevalence and distribution of MSD in Queensland veterinarians. Almost two-thirds (63%) experienced MSD of the lower back in the previous 12 months (approximately one-fifth of all MSD reported) and 57% had experienced neck MSD.²⁵ The correlations between personal factors, stress levels and

MSD was studied. They found that work stress caused by time pressures was associated with a three- to fourfold increase in shoulder MSD, which was consistent with other research in this field. More than half of the participants in a study involving the veterinary nurses in Australia reported that they suffered from chronic back or neck pain.¹⁷ The frequently attributed causes were lifting, standing in difficult positions for too long, bending, restraining animals and stress.¹⁷ A nested case control study among veterinarians practicing in Minnesota examined risk factors for job-related injuries and found increased rates associated with prior injuries, participation in sports, no sharps boxes present, current smoking, and six or fewer hours of sleep. Decreased rates were observed for participation in aerobic activities, perception of lower risk and experience.³⁷

The work related tasks which have significant contribution in the development of MSDs possess certain risk qualities like involvement of high intensity forces, long exposure duration, highly repetitive exertions, strong, and sometimes awkward postures, strong or non lasting muscular strain, disadvantageous environmental or psychosocial conditions etc.²⁴ The American Veterinary Medical Association (AVMA) Ergonomics Task Force identified a number of risk factors inherent in a veterinary practice. These risk factors include awkward postures; high hand force, highly repetitive motions, repeated impact, heavy, frequent, or awkward lifting, and moderate to high hand-arm vibration. They are relevant in the work environment of veterinarians and their assistants. The presence of one or more of these risk factors within a task creates ‘caution zone tasks,’ which needs to be eliminated through the implementation of engineering controls or the application of ergonomic techniques.^{38,39} Table 2.3 gives a detailed description of these risk factors with appropriate examples.

Table 2.3: Risk factors that could lead to musculoskeletal injury in veterinarians

Risk factors that could lead to musculoskeletal Injury (Caution Zone)	Examples of tasks relevant to veterinarians
1) Awkward Postures	
a) Working with the hand(s) above the head, or the elbow(s) above the shoulder, for extended time periods that could cause muscle fatigue and injury.	Floating teeth; rectal palpations; dystocias, prolapse repair, stocking shelves
b) Working with the neck, back or wrist(s) bent more than 30 degrees for extended time periods that could cause muscle fatigue and injury.	Dystocias, colic surgeries, palpations, floating teeth; venipuncture; grooming; kennel and stall cleaning; data entry
c) Squatting or kneeling for extended time periods that could cause muscle fatigue and injury.	Bleeding swine, surgeries performed while kneeling
d) Sustained position for extended time periods that could cause muscle fatigue and injury.	Surgery, dentistry, driving a vehicle; tasks that require a static posture
2) High Hand Force	
a) Pinching an object and applying more than 2 pounds of force per hand for extended time periods that could cause muscle fatigue and injury.	Large animal abdominal surgeries
b) Gripping an object and applying more than 10 pounds of force per hand for extended time periods that could cause muscle fatigue and injury.	Ear tagging, restraint
3) Highly Repetitive Motion	
a) Repeating the same motion with the neck, shoulders, elbows, wrists, or hands with little or no variation every few seconds for extended time periods that could cause muscle fatigue and injury.	Palpation, administration of injections, dental work, grooming/trimming, surgical procedures, venipuncture and blood collection
b) Performing intensive keying for extended time periods that could cause muscle fatigue and injury.	Data entry

Risk factors that could lead to musculoskeletal Injury (Caution Zone)	Examples of tasks relevant to veterinarians
4) Heavy, Awkward Lifting	
a) Repeatedly lifting heavy objects until muscle fatigue occurs which could lead to musculoskeletal injuries.	Patient lifting, restraining, and positioning, carrying equipment; large animal foot and leg work; carrying feed and other products, dystocias
b) Infrequently lifting heavy objects until muscle fatigue occurs which could lead to musculoskeletal injuries.	Patient lifting, restraining, and positioning, carrying equipment, large animal foot and leg work, carrying feed and other products, dystocias
5) Moderate to High Vibration	
a) Using motorized equipment, percussive tools or other hand tools that typically have moderate to high vibration for extended time periods which could cause muscle fatigue and injury.*	Equine dentistry (using motorized equipment), power grinding hooves
6) Repeated Impact	
a) Impacting with the hand or knee repetitively for extended time periods that could cause muscle fatigue and injury.	Unlikely to occur in a veterinary care environment, but acknowledged as a risk factor

Source: Ergonomics Guidelines for Veterinary Practice, American Veterinary Medical Association^{38,39}

2.3. Methodological challenges in conducting research on injuries and musculoskeletal disorders among veterinarians

2.3.1. Recruitment of study subjects

The work locations of veterinary professionals in a region are scattered over a wide geographical area. Many of them are required to travel extensively, especially in rural areas, which make it difficult to meet them their offices. All these factors create challenges to researchers who attempt to directly recruit them as study subjects. Almost all reviewed research among veterinarians were done using self administered

questionnaire sent through mail. The response rate varied from about 45% to 68%. The low response rate occurring due to these factors dents the credibility of the scientific arguments put forward by these works. It can also increase the possibility of selection bias in case control designs if those subjects who had exposure were more likely to participate. A non-responder analysis can be done using a brief questionnaire to assess non response bias.³⁷

The Queensland study used self-reporting MSD questionnaire based on the Standardized Nordic Musculoskeletal Questionnaire sent through mail. This was to ensure maximum cost-effectiveness and minimum disruption to their daily lives.²⁵ Postal questionnaires are often the only financially viable option for collecting data among healthcare workers and allied professionals.²⁵ Wilkins III et al claims to have increased the response rate to 90% by employing a mixed mode survey design among female veterinarians.⁴⁰

2.3.2 Validity of self reported burden

The self reported burden of morbidity among professionals is often plagued by issues regarding validity and subjective interpretations. This can be especially worthy of concern because of inherent biases involved in self reporting of workload. If the outcome or exposure involved can affect insurance premiums or health benefits, the validity of self assessment becomes disputable. Most of the reviewed studies have not made active efforts to address this issue. Viikari-Juntura et al assessed self-reported physical work load in epidemiologic studies on musculoskeletal disorders by questionnaire and logbook against task analysis and observation and reported that the accuracy of the assessments is not good for studying quantitative exposure-effect relationships. They also mentioned that the perception of musculoskeletal pain may bias the self-assessment of work load.⁴¹

2.3.3 Limitations of cross-sectional studies to assess cumulative injuries

There is a preponderance of cross-sectional designs in epidemiological studies on musculoskeletal disorders in which health and exposure data are collected simultaneously, which in turn undermines the quality of scientific evidence on this topic as these illnesses are cumulative type injuries.⁴² Punnet and Wegman assert that cross-sectional studies unavoidably over sample those disorders that last for a long time and are less likely to capture those that last only a short period. The situation is further complicated by 'healthy worker effect' which is caused by the exposed persons who develop work-related MSDs leaving the concerned employment disproportionately.^{42,43} This effect can be of a lesser importance in veterinarians as they are perceived to be less likely to switch to other careers.

2.4. Rationale for the study

An extensive search of literature fails to return significant information regarding the occupational health risks faced by veterinarians in India. Although there have been many studies conducted abroad, there can be significant differences in the patterns of risk due to differences in various contributing factors like social, economic, cultural, demographic background. In the absence of extensive studies on this group, the true impact of these occupational hazards in the lives of these professionals remains completely obscure.

OBJECTIVES AND METHODOLOGY

The objectives and the methodology used for the study on physical injuries and musculoskeletal disorders among veterinarians are described in this chapter.

3.1. Objectives

1. To determine the types of physical injuries and musculoskeletal disorders (MSD) among veterinary practitioners in Kerala and estimate the prevalence of these.
2. To identify the occupational risk factors for physical injuries and musculoskeletal disorders (MSD) among veterinary practitioners in Kerala.

The key questions addressed in this study were;

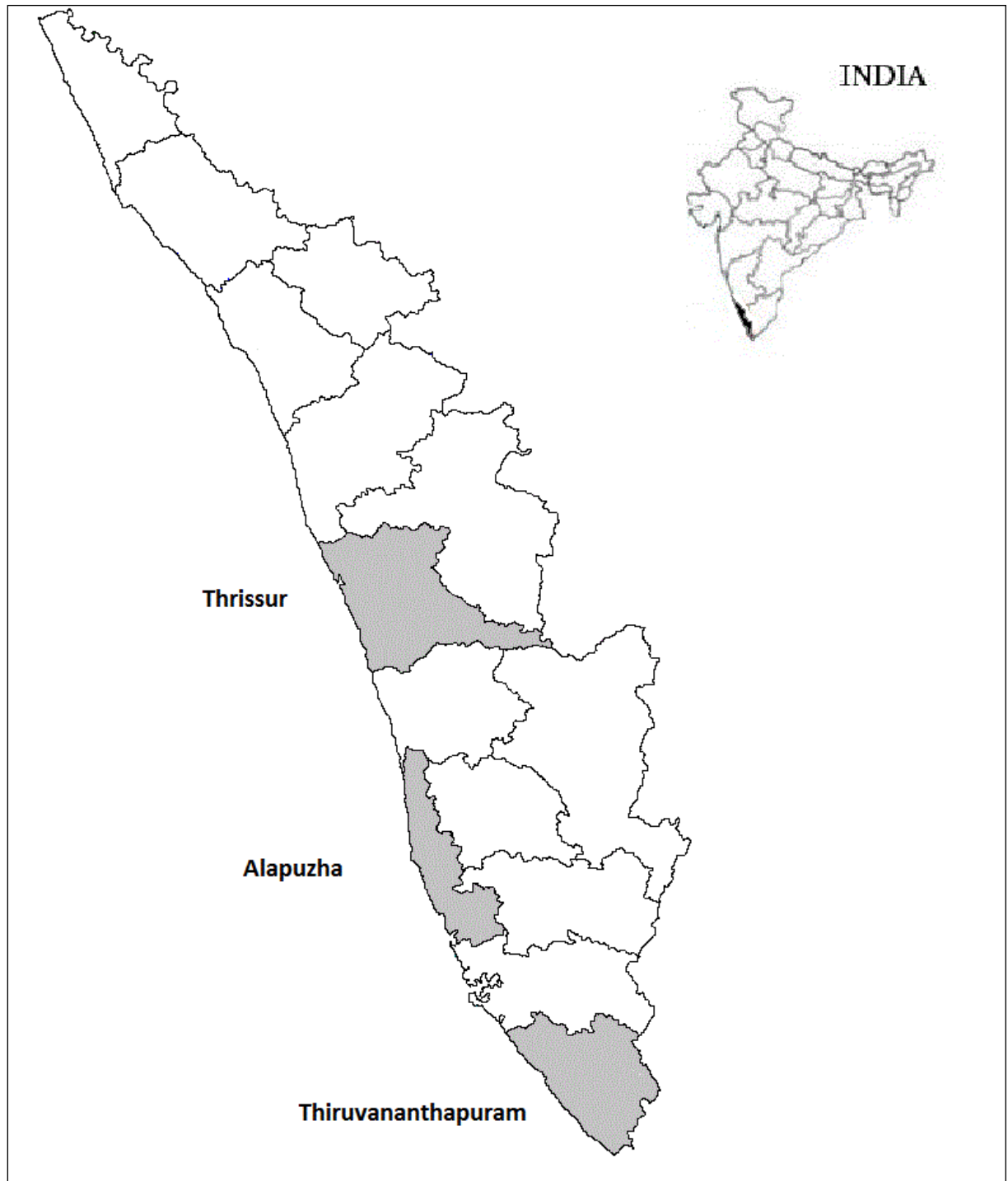
1. What is the nature and extend of injuries sustained by veterinarians in Kerala, as part of their job? How often do these occur and how severe are they? What are the major risk factors for injury?
2. Do vets suffer from musculoskeletal disorders? What is the prevalence and the consequence of MSD among vets?
3. What are the major risk factors for physical injuries and MSDs in vets? Do age, gender, years of experience, location etc play a role in the difference in distribution of these injuries? Are there any pragmatic solutions to prevent them?

3.2 Methodology

3.2.1. Study design

This study was a cross sectional survey of selected veterinarians in Kerala

Figure.3.1 Map of Kerala showing the showing the districts involved in the study.



3.2.2. Study setting

The study was conducted in three districts in Kerala with relatively high number of veterinarians; viz, Thiruvananthapuram, Thrissur and Alapuzha. The pre-selected study participants were met in person and, upon fulfilling the inclusion criteria, were provided with a self administered questionnaire at the premises of their offices or home, whichever was deemed convenient by the participant. Many of the selected veterinarians were met by principal investigator at the monthly meeting of the officers of Animal Husbandry Department at District Animal Husbandry Office. A small number of subjects were given questionnaire mailed through post, upon their insistence.

3.2.3. Sample size

Sample size has been estimated based on the expected prevalence of MSD among veterinarians. Since there were no studies done in India on this topic, this information was obtained from existing literature on research done elsewhere. The expected prevalence of 27 percent was taken as an average of prevalences of MSDs and injuries reported by several studies.^{6,7,15,17,25} Sample size estimation was done using Epi info Statcalc, with an expected prevalence of MSD in veterinarians as 27 percent and a worst acceptable limit of 21.6 percent. The total number of veterinary practitioners in Kerala was taken as 1846, which was obtained from the directory of members of Indian Veterinary Association, Kerala.³ The estimate turned out as 228, with an expected non-response rate of 10 percent, the sample size was finally set at 250.

This sample size calculation can also be shown using the formula; $S = 1.962(P(1-P)) / (D^2)$ where S= Sample size for a very large (infinite) population, P= Expected prevalence (27%), 1.96 = a percentile of the standard normal distribution for a 95 percent confidence level, D = one half the width of the desired sample confidence interval (27 -

21.6 = 5.4). $S = 1.962 \times (27 \times 73) / 5.42 = 259.66$. S is then adjusted by a finite population correction factor to obtain the final estimate of sample size as follows: Sample Size = $S / (1 + (S / \text{population}))$. Population = 1846 Sample size = $259.66 / (1 + (259.66 / 1846)) = 227.64$. After adding a 10 percent non response rate, the sample size was computed to be 250.4 and rounded off to 250.

3.2.4. Inclusion criteria

1. All veterinarians who had been actively engaged in field practice for the past 3 years were considered for the study.
2. Age of the participant should not exceed 55 years (age of retirement in Kerala).

3.2.5. Sample selection procedures

Indian Veterinary Association (IVA) Kerala Directory contained the addresses and contact numbers of all its members. The sample had been drawn from three districts in Kerala with relatively high number of veterinarians; viz, Thiruvananthapuram, Thrissur and Alapuzha. The total number of study subjects selected was proportional to the number of practising veterinarians in each district. Systematic random sampling was employed to select a sample of 250 study subjects from these districts. The total number of listed veterinarians in Thiruvananthapuram, Thrissur and Alapuzha was 271, 214 and 160 respectively, which was in the proportion 1.69: 1.34: 1. Therefore the sample size of 250 had been divided among the three districts in this proportion, which turned out to be 105, 83 and 62 respectively for Thiruvananthapuram, Thrissur and Alapuzha. For selecting individual veterinarians from the district wise list, a random number was chosen and starting with this number, and subsequent individuals who are apart by a fixed interval were selected to compile a list of systematically chosen random list of

veterinarians. Should the selected veterinarian in the district not fulfil the inclusion criteria or no longer worked in the concerned district, the immediate next veterinarian in the list was considered as a substitute. Substitution was not practiced in the case of people who did not participate (Non responders) and those who could not be contacted.

3.2.6. Data collection methods

The data collection tool used for this study was a self administered questionnaire. The study tool intended to capture the nature and magnitude of musculoskeletal disorders (MSD) and physical injuries. It also collected information about various potential occupational risk factors associated with practising veterinarians and the preventive steps taken to minimize such injuries. The language of the questionnaire was English. The total number of questions included was 70. Most of the participants were able to complete the questionnaire in a period of about 20 minutes.

Musculoskeletal disorders (MSD): This study attempted to capture MSD as a description of symptoms like joint pains and aches for epidemiological analysis, and not as a substitute for a clinical description of any particular disease. Thus this research tool collected information about aches and pains of 10 body sites- neck, shoulder, lower back, upper back, elbows, arms, wrists/hands, thighs, knees, ankles/feet using a modified Nordic musculoskeletal questionnaire. The period of interest was the immediate 12 months before the date of inquiry. Extra questions concerning duration of the problem and loss of work days due to MSD had been added as modifications.

Physical injuries: Physical injuries are singular events causing trauma due to physical causes, which in most cases involved handling of animals. This questionnaire collected data on nature and types of injuries, those that required hospitalization/ medical attention, and resulted in absence from work for one or more days. The participants were asked to

record the number of events of different types of injuries during the past one year. There were also questions concerning the occurrence of any major injury, which resulted in hospitalization or absence from work for five days or more, ever during their career. Issues regarding recall could not be ruled out in data collected using this tool.

Occupational risk factors for injuries and MSD: This questionnaire collected data regarding several of aspects of a veterinary practice which could prove to be relevant risk factors to injuries and MSD in veterinarians. Some of these parameters were; age, sex, years of experience, type of practice, type of cases handled, nature of work, working hours, mode of transport during work, work load, and other work characteristics. These factors were chosen to be included in the questionnaire on the basis of available literature, or they were included based on some narratives existed in the study population. For example, many of the veterinarians in Kerala believed that long hours of travelling on motorcycle would result in back pain. To conduct an epidemiological scrutiny on this narrative, information regarding the mode of transportation was obtained.

Behaviour change: The questionnaire was designed to capture the prevalence of injuries and MSD over a period of one year, but the information on other factors were collected with respect to the current scenario at the point of inquiry. This issue assumes paramount importance, especially in case of MSD due to the fact that they could result from exposures occurring over a long period of time, extending to many years. Also, anybody who develops pain or discomfort at any body part might try to limit their activities using that body part. They are also likely to stop or reduce those activities they think are responsible for the pain. This can definitely incapacitate the capability of the study to identify those tasks which predispose the individuals to MSD, using a cross sectional design. An attempt has been made to collect information, at least in part, about behaviour change in the past, from those who reported to have suffered from any MSD, in order to

understand the level of involvement these factors. The section of the questionnaire immediately after NMQ is dedicated for this purpose.

The study commenced on June 16, 2011. All data collection activities in the field were carried out by the Principal Investigator. Selected veterinarians were met directly or contacted over the phone for an appointment. Those who consented to participate and fitting the inclusion criteria were handed over the questionnaire which was self administered by the participant and handed back immediately if possible. In case the participant was not in a position to return the questionnaire immediately, a second visit was scheduled or other alternative arrangements were made. A primary scrutiny of the returned questionnaire was carried out on the spot and any discrepancies, if found, were raised and sorted out with the participant. In the case of questionnaires returned later, this was done over the phone, with the prior permission of the participant, should any discrepancy arise. Some of the participants were given the questionnaires by post, on their request. Data collection activities ended on 2 September 2011.

Data entry proceeded simultaneously with data collection. This helped to reduce errors and facilitate efficient verification. SPSS version 17.0 was used for data entry.

3.2.7. Data cleaning

Cleaning of data was done before performing analysis. This was done by checking for incompatibilities or inconsistencies, missing values, setting checks and limits to avoid abnormal values or erroneous outliers.

3.2.8. Ethical considerations

Participation in this study was completely voluntary. The study subjects were free to discontinue their participation at any stage of the study. All potential participants

approached were informed that non participation would not affect any present or future services from SCTIMST. The questionnaire was not anonymised but strict confidentiality would be maintained at all stages of the study. Individual particulars obtained from the veterinarians would not be made available to any of the authorities as it might have implications for insurance premiums and postings. Therefore, only code numbers were used in data entry and schedules would be safe guarded carefully until the required period of 3 years⁴⁴ and then subsequently destroyed. District level disaggregated data would not be generated, reported or published.

3.2.9. Analysis of data

Univariate, bivariate and multivariate analyses of the dataset were performed using SPSS (version 17 for Windows).

Outcome variable: Prevalence of physical injuries and musculoskeletal disorders.

For bivariate and multivariate analyses of physical injuries, ‘significant injury’ was considered as the outcome variable, which would be defined as follows;

Significant injury: Any injury resulting in hospitalization of the subject or absence from work for one or more days

For analysing musculoskeletal disorders MSD (PA and AW) was considered as outcome variable.

MSD (PA and AW): Any musculoskeletal disorder as reported using NMQ, which prevented the subject from performing normal activities or resulted in absence from work.

Predictor variables: The different categories of predictor variables included in the analysis were as follows;

1. Demographic factors (age, sex, body height).
2. Factors related to daily routine (hours of sleep at night, leisure time physical activity/exercise, hours of travelling).
3. Factors related to veterinary practice (years of experience, type of practice, type of cases handled, working hours, mode of transport and other risk related activities).

Univariate analysis of all predictor variables was performed, disaggregated by sex, to understand the distribution of these factors in the population. Bivariate and multivariate analyses were also done, with significant injury and MSD (PA and AW) as outcome variables, along with appropriate statistical tests to demonstrate the significance of the findings. Binary logistic regression was employed to construct a multivariate model to identify the significant risk factors for MSD.

This chapter is divided into five sections. The first two sections describe the demographic profile and work characteristics of the study participants. The subsequent sections explain the types of physical injuries and musculoskeletal disorders and their prevalence among veterinarians in Kerala. The last section summarizes the analysis to identify potential risk factors for physical injuries and musculoskeletal disorders through bivariate and multivariate models.

4.1. Demographic profile

Sex distribution: More than 60 percent of the sample were men. Among all the veterinarians in the three districts, from where the sample was drawn, around 65 percent are men.

Table 4.1 Percentage distribution of veterinarians in the sample by sex

	N	%
Male	110	61.1
Female	70	38.9
Total	180	100.0

Age, body height and years completed in practice: The mean age (SD) of the sample was 40.75 (5.5) years. The age of the participants varied from 28 to 53 years. Veterinarians above the age of 55 were excluded from the study. There was no significant difference observed in age or years of experience between male and female subjects. The observed difference in height was anticipated.

Table 4.2 Mean age, body height and years completed in practice of veterinarians in the sample by sex, 2011

	Minimum	Maximum	Mean	S D	Mean Male (95% CI)	Mean Female(95% CI)
Age (years)	28	53	40.75	5.5	41.06 (39.92 -42.19)	40.31(39.15 41.48)
Height** (cm)	148	183	164.06	8.9	169.04(167.7-170.33)	156.03(154.6-157.38)
Years of practice	3	28	15.44	5.8	15.83 (14.68-16.99)	15.03(13.63-16.43)

Table 4.3 Percentage distribution of veterinarians in the sample by age and sex

Age group (years)	Female (%)	Male (%)	Total (%)	P value (Chi square)
Less than 35	9 (34.6)	17 (65.40)	26 (100.00)	0.050
35 - 45	48 (45.30)	58 (54.70)	106 (100.00)	
More than 45	11 (24.40)	34 (75.60)	45 (100.00)	
Total	68 (38.40)	109 (61.60)	177 (100.00)	

Routine exercise or leisure time physical activity: More than one third (35.2%) of the participants reported that they routinely engaged in exercise or leisure time physical activity. Among these, the average (SD) amount of physical activity per week was 4.08 (4.30) hours. A significant impact of gender could be observed in the pattern of this behaviour. Odds of men engaging in physical activity were 2.78 times higher than those of women veterinarians. It could not be ruled out whether this effect was due to systematic over reporting by men, regarding their involvement in routine physical activity, as any means of validation is beyond the scope of current research.

Table 4.4 Percentage distribution of veterinarians in the sample by sex and physical activity, 2011

Physical activity	Male (%)	Female (%)	Total
Yes	48 (43.60)	15 (21.70)	63 (35.20)
No	62 (56.40)	54 (78.30)	116 (64.80)
Total	110 (100.00)	69 (100.00)	179 (100.00)
OR	2.787	Referent	
95% CI for OR	1.405 - 5.529		

Sleep: The study participants had been asked to provide the details on their sleep during the night of the previous working day. No significant difference could be observed in the pattern of sleep between the sexes.

Table 4.5 Percentage distribution of veterinarians in the sample by sex and hours of sleep obtained per day, 2011

Sleep	Male (%)	Female (%)	Total (%)	P value (Chi square)
Less than 5 hours	3 (2.70)	1 (1.40)	4 (2.20)	0.325
5-6 hours	48 (43.60)	24 (34.30)	72 (40.00)	
6-7 hours	59 (53.60)	44 (62.90)	103 (57.20)	
7-8 hours	0 (0.00)	1 (1.40)	1 (0.60)	
	110 (100.00)	70 (100.00)	180 (100.00)	

4.2 Work characteristics

Location and type of practice (work): The participants had been asked to describe their locality of work place as urban or semi urban or rural. A vast majority (74.4%) classified their work location as rural. However, this description is solely based on their own judgement as they had not been given any specific criteria for the classification of their practice setting. An attempt was made to identify differences in work of the participants, based on the type of animals they are coming into contact during their job. More than half (54.4%) of them claimed to have a mixed practice, i.e. they encounter different kinds of

animals, big and small, as their patients. A large percentage of the rest (41%) reported treating more of large animals like cows, buffalos, goats etc.

Table 4.6 Percentage distribution of veterinarians in the sample by location of practice, 2011

	n	%
Urban	23	12.8
Semi urban	23	12.8
Rural	134	74.4
Total	180	100.0

Table 4.7 Percentage distribution of veterinarians in the sample by type of practice, 2011

Type of practice	n	%
Mostly large animal	74	41.1
Mostly small animal	7	3.9
Mixed practice	98	54.4
Equine practice	1	0.6
Total	180	100.0

Breaks during work: More than two-thirds (67.4%) of the participants took less than two breaks during their work day. In fact, more than a third did not manage any breaks in their work day as reported.

Table 4.8 Percentage distribution of veterinarians in the sample by number of breaks during work day, 2011

Number of breaks	n	%	Cumulative %
No breaks	63	35.4	35.4
one	57	32.0	67.4
two	25	14.0	81.5
three	19	10.7	92.1
four	11	6.2	98.3
five or more	3	1.7	100.0
Total	178	100.0	

Time spent for travel and work: The average number of hours worked by a veterinarian on his/her previous working day was 7.38. Within these many hours, 2.8 hours were used

Table 4.9 Percentage distribution of veterinarians in the sample by time spent for travel and work, 2011

	Minimum	Maximum	Median	Mean	S D
Hours of travel from home to work and back*	0.00	6.50	1.0	1.51	1.26
Hours of work*	1.00	14.00	2.0	7.38	2.38
Hours of travel during work*	0.00	12.00	7.0	2.80	2.15
Total hours dedicated to work *	2.00	16.00	8.83	8.89	2.64

* All time measurements specified in this section is in decimal format and not in terms of hours and minutes.

for travelling during work. For most veterinarians majority of the clinical cases require their presence in the field, which necessitates house/ field visits. This forces them to spend a considerable time travelling during work, in addition to the time spent on travelling to the workplace and back to home. The mean (SD) travel time from home to work and back was 2.80 (2.15) hours. The total time dedicated to work was calculated by adding the work hours and the time spent on travelling to workplace and back for each study subject, which on average was 8.83 hours.

Mode of transportation during work: The popular means of transportation among the veterinarians were motorcycle, car and auto-rickshaw. There is a distinct difference in the preferences between male and female veterinarians, in which the former preferred two wheelers (motorcycles) over other means, while the latter preferring mainly auto-rickshaws.

Table 4.10 Percentage distribution of veterinarians in the sample by sex mode of transportation during work, 2011

	Male (%)	Female (%)	Total (%)	P value (Chi square)
Two wheeler	64 (58.20)	17 (24.30)	81 (45.00)	<0.001
Car	16 (14.50)	5 (7.10)	21 (11.70)	
Auto rickshaw	29 (26.40)	42 (60.00)	71(39.40)	
Any other	1 (0.90)	6 (8.60)	7 (3.90)	
	110 (100.00)	70 (100.00)	180 (100.00)	

Physically demanding clinical procedures: The study subjects had been asked whether they commonly (more than 10 procedures per month) engaged in procedures such as attending dystochia, prolapsed uterus/vagina/cervix of large animals, large animal surgeries etc which require considerable physical strength. Two-thirds of the participants perform more than 10 such procedures per month. Men have 3.9 times significantly higher odds for commonly engaging in such procedures than women.

Table 4.11 Percentage distribution of veterinarians in the sample by sex and reporting of doing physically demanding clinical procedures, 2011

	Male (%)	Female (%)	Total (%)
Yes	85 (78.00)	33 (47.10)	118 (65.90)
No	24 (22.00)	37 (52.90)	61 (34.10)
Total	109 (100.00)	70 (100.00)	179 (100.00)
OR (95% CI)	3.971 (2.068-7.624)	Referent	

Clinical workload: To understand the magnitude of their workload, the participants were asked to provide the number of different types of clinical procedures they had engaged in during the previous month. The average number of clinical procedures in one month was 231. A few types of procedures showed significant differences between men and women. On average, men performed significantly higher number of surgeries that lasted more

than 40 minutes, dystochia cases (difficulty in giving birth) and correction of prolapsed (prolapsed uterus, cervix or vagina in large animals).

Table 4.12 Average of clinical procedures performed in the previous month of inquiry by type of procedure and sex of the veterinarian in the sample, 2011

	Male		Female	
	Mean (95% CI)	SD	Mean (95% CI)	SD
Clinical cases	269.24 (218.15 - 320.34)	266.59	191.0 (116.43 - 265.66)	296.28
Per rectal examinations	87.34 (74.21 - 100.46)	68.47	55.98 (46.31- 65.66)	38.41
Hoof examinations	2.59 (1.65 - 3.52)	4.88	1.98 (0.95 - 3.02)	4.10
Surgery less than 40 minutes	2.7 (1.04 - 4.36)	8.66	0.67 (0.24 - 1.09)	1.69
Surgery more than 40 minutes**	5.69 (4.05 - 7.33)	8.56	2.59 (1.12 - 4.05)	5.82
Dystochia attended**	7.21 (3.37 - 11.06)	20.07	2.37 (1.8 - 2.93)	2.26
Downer cows attended	4.03 (3.29 - 4.76)	3.84	2.9 (2.1 - 3.71)	3.18
Correction of prolapse**	1.93 (1.482.37)	2.34	0.97 (0.57 - 1.37)	1.59

4.3 Prevalence of physical injuries

The study participants were asked to provide the details of physical injuries they suffered during the immediate 12 months prior to the date of inquiry. Information was sought regarding the nature of injury, its severity and consequence (absence from work, needing medical care or hospitalization) and the type of injury, related to the source (dog bite, kicking). Close to half (45.6 percent) of study subjects suffered at least one event of absence from work due to injury. The percentage of subjects who had to undergo hospitalization at least once was 17.2.

Table 4.13 Distribution of the number of work related injuries among veterinarians in the sample during past 12 months, 2010-2011

Nature of injury sustained	Mean	Median	S D	Minimum	Maximum
Any injury during work	3.51	3.00	4.971	0	35
Injury during handling	2.87	2.00	3.315	0	26
Injury needing medical care	1.18	1.00	1.862	0	20
Injury causing absence from work	0.79	0.00	1.140	0	6
Injury needing hospitalization	0.22	0.00	0.553	0	4

Table 4.14 Distribution of the number of injuries requiring absence from work for 1 or more days among veterinarians in the sample, 2010-2011

No of injuries in past 12 months	n	%	Cumulative %
6	2	1.1	1.1
4	5	2.8	3.9
3	6	3.3	7.2
2	26	14.4	21.7
1	43	23.9	45.6
0	98	54.4	100.0
Total	180	100.0	

Table 4.15 Distribution of the number of injuries that required hospitalization among the veterinarians in the sample, 2010-2011

No of injuries /events	n	%	Cumulative %
4	1	0.6	0.6
2	6	3.3	3.9
1	24	13.3	17.2
0	149	82.8	100.0
Total	180	100.0	

Figure 4.1 Different types of injuries as a percentage of total number of injuries

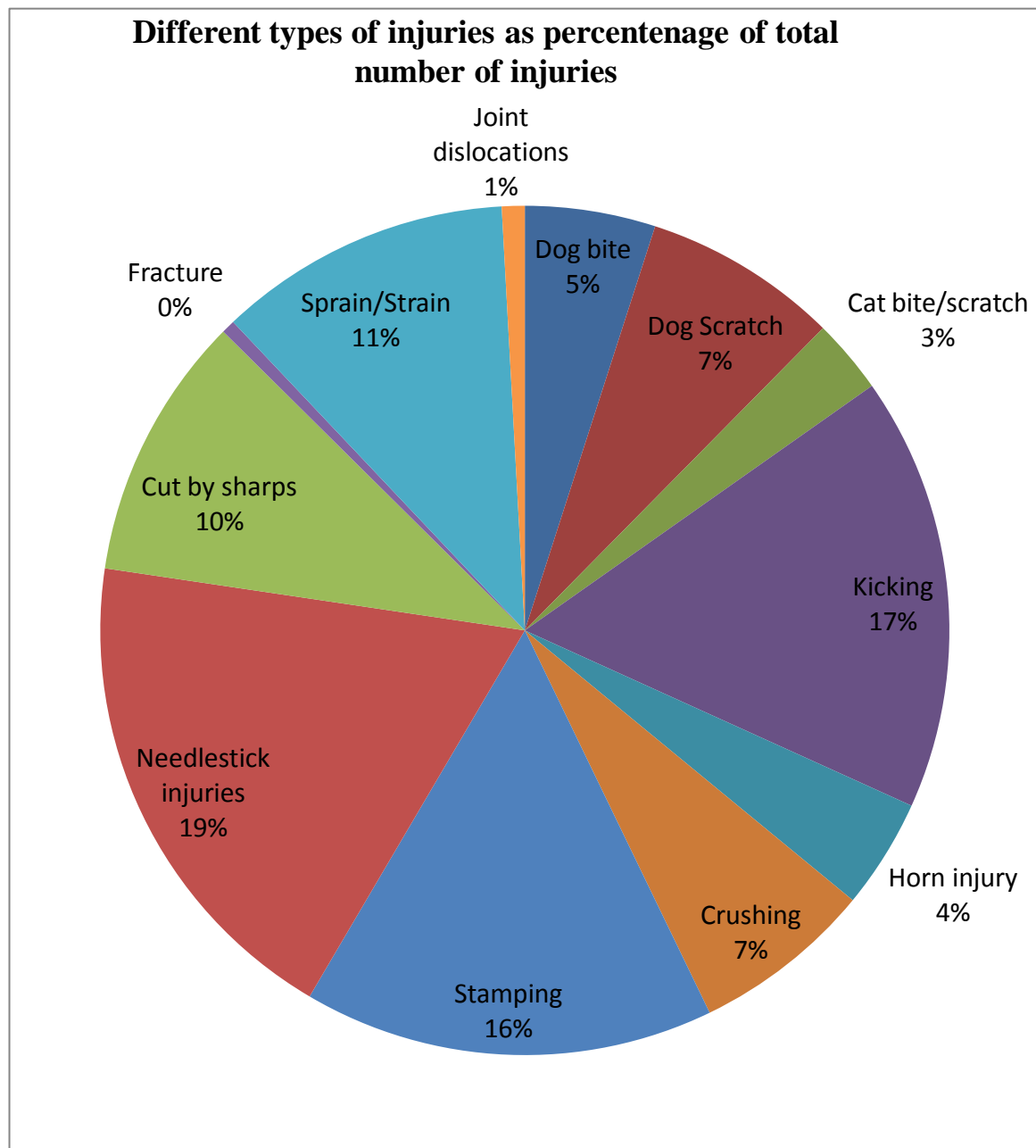
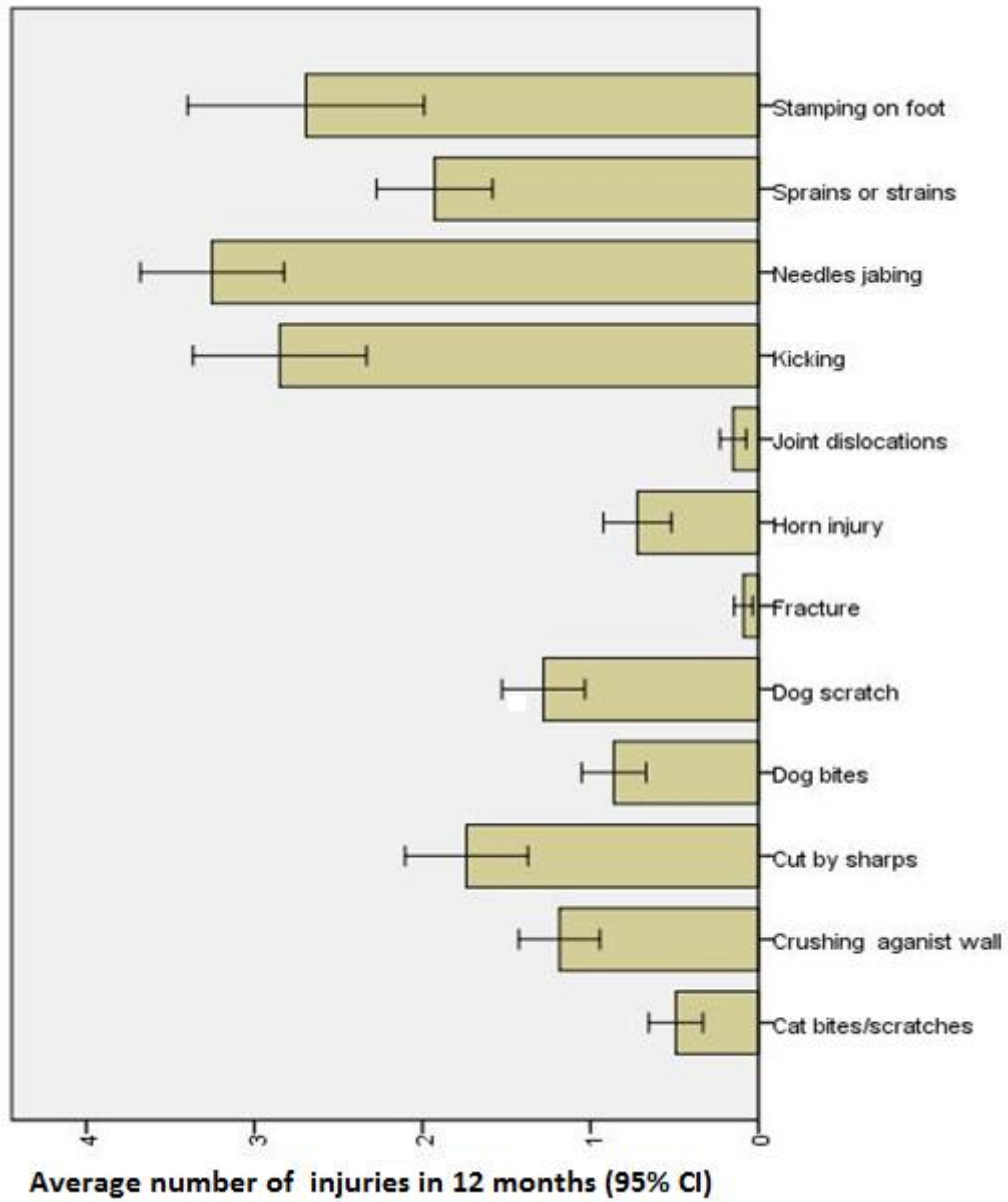


Figure 4.2 Average numbers of injuries in 12 months, with 95% CI



Prevalence of significant injury

A significant injury was defined as the one that resulted in hospitalization, or in not being able to work for one day or more. Therefore, anybody who had undergone hospitalization or absence from work due injury during the 12 months immediately prior to the date of inquiry, would be considered to have suffered from a significant injury. The prevalence of it among the veterinarians was 47.5percent.

Table 4.16 Prevalence of significant injury in 12 months among veterinarians in the sample, 2010-2011.

Significant injury	n	%	95% CI for proportion
No	94	52.5	
Yes	85	47.5	40.09 -54.87
Total	179	100.0	

Table 4.17 Distribution of veterinarians in the sample by experience of injury ever during career, 2011

		n	%
Hospitalization due to injury ever during career	Yes	48	26.7
	No	132	73.3
	Total	180	100.0
Absence >5 days due to injury ever during career	Yes	57	31.7
	No	123	68.3
	Total	180	100.0

4.4 Prevalence of musculoskeletal disorders (MSD)

Prevalence of musculoskeletal disorders (MSD) was assessed using Nordic Musculoskeletal Questionnaire (NMQ). This tool captures aches, pain and discomfort in 9 parts of the body, during the past 12 months and past 7 days (presently suffering). To understand significant impact MSDs, information was also sought about the inability of performing normal activities, duration of suffering (3 months) and absence from work due to MSDs. Table 4.18 shows the type of MSDs having the highest prevalence among veterinarians involved in this study, disaggregated by sex. No significant difference could be observed in this regard between men and women. Moreover two categories of disorders, viz; disorders of the neck and lower back are the most significant contributors to overall musculoskeletal disorders. A vast majority of the vets experienced at least one

MSD during the past one year – the prevalence of at least one MSD was 89.1 percent and the incidence was 70.9 percent, indicating that experience of some form of MSD was a common occurrence.

Table 4.18 Prevalence of major MSDs among veterinarians in the sample by sex

MSD	During past 12 months				During past 7 days (presently suffering)			
	Male %	Female %	Total %	OR (95%CI)	Male %	Female %	Total %	OR (95% CI)
Neck	67.3	62.9	65.8	1.25(0.649-2.275)	33.6	27.1	31.1	1.360(0.704 - 2.629)
Shoulder	57.3	55.7	56.7	1.065(0.582-1.950)	32.7	30.01	31.17	1.135(0.594 - 2.170)
Lower back	70.0	58.6	65.6	1.650(0.882-3.088)	47.3	38.6	43.96	1.428(0.776 - 2.627)
Upper back	31.8	34.3	322.8	0.894(0.474-1.690)	20.0	18.6	19.4	1.096(0.511 - 2.349)
Elbow	22.7	30.0	25.6	0.686(0.348 - 3.088)	10.9	12.9	11.7	0.830(0.330 -2.086)
Wrist or hand	41.8	38.6	40.6	1.145(0.620-2.112)	25.5	18.6	22.8	1.497(0.715 – 3.317)
Hip or thigh	29.1	27.1	28.3	1.101(0.546-2.149)	20.9	17.1	19.4	1.278(0.590 - 2.768)
Knee	36.4	37.1	36.7	0.967(0.520-1.800)	17.3	20.0	18.3	0.835(0.388 - 1.797)
Ankle or feet	29.1	38.6	36.7	0.653(0.347 - 1.231)	15.5	18.6	16.7	0.801(0.362 – 1.773)
Any part	89.1	90.0	89.4	0.907(0.339-2.428)	70.9	60.0	66.7	1.625(0.865 - 3.054)

As all MSDs can be equally debilitating and it was not possible to treat any one as being more important than the other, a conservative estimate of MSD was sought. This was done by limiting the operational definition of MSD to any MSD that either resulted in preventing normal activities or absence from work. This and other restricted definitions of MSD are shown in table 4.19. The most conservative definition of MSD resulting in absence from work yielded a prevalence of 33.9 percent whereas the broader one of any

MSD that extended beyond 3 months resulted in a prevalence of 56.7 percent. To find balance between the potential over reporting of MSDs in self reported estimates and genuinely disabling conditions, those MSDs which resulted in restrictions in physical activities or absence from work were alone considered to be MSDs that were severely restricting the functioning of veterinarians. This definition, yielded an estimate of 52.2 percent for the prevalence of MSDs among vets in Kerala.

Table 4.19 Prevalence of any type of MSD among veterinarians in the sample

		n	%	95% CI for proportion
Any MSD in past 12 months	Yes	161	89.4	84.91 – 93.97
	No	19	10.6	
	Total	180	100.0	
Any MSD in past 7 days	Yes	120	66.7	59.71 – 73.61
	No	60	33.3	
	Total	180	100.0	
Any MSD preventing activities	Yes	86	47.8	40.41 – 55.14
	No	94	52.2	
	Total	180	100.0	
Any MSD duration >3 months	Yes	78	43.3	36.02 – 50.64
	No	102	56.7	
	Total	180	100.0	
Any MSD causing absence from work	Yes	61	33.9	26.90 – 40.87
	No	119	66.1	
	Total	180	100.0	
Any MSD preventing activities or absence from work(MSD PA &AW)	Yes	94	52.2	44.85 - 59.58
	No	86	47.8	
	Total	180	100	

Behaviour change: Those participants who reported to be suffering from MSD were asked about any in change their work or other activities that happened due to the condition. These questions were asked only to those who reported having MSD. Table 4.20 summarizes the results of this section.

Table 4.20 Behaviour change due to MSD among veterinarians in the sample

Behaviour change due to MSD		n	%	% of total sample
Started Physical activity	Yes	51	33.3	28.3
	No	102	66.7	56.7
	Total	153	100	85
Changed vehicle	Yes	43	27.6	23.9
	No	113	72.4	62.8
	Total	156	100	86.7
Preferred less demanding cases	Yes	44	28	24.4
	No	113	72	62.8
	Total	157	100	87.2
Sought more assistants	Yes	83	53.2	46.1
	No	73	46.8	40.6
	Total	156	100	86.7
Considered quitting clinical practice	Yes	20	12.9	11.1
	No	135	87.1	75
	Total	155	100	86.1
Sought medical treatment	Yes	93	59.6	51.7
	No	63	40.4	35
	Total	156	100	86.7

4.5 Risk factors for physical injuries and musculoskeletal disorders (MSD)

4.5.1 Risk factors for physical injury: Results of bivariate analysis

Bivariate analysis was performed with significant injury as outcome variable and different categorical and continuous variables as independent variable. The categorical variables were cross tabulated against the occurrence of significant injury. Means of different continuous variables were compared for significant difference between injured and uninjured. Four variables were found to be significantly associated with a significant injury.

Table 4.21 Bivariate analysis: Association between Significant injury and selected categorical variables

Variable	Categories	Significant injury		OR (95%CI)	P value
		Yes (%)	No (%)		
Sex**	Male	60(55.0)	49(45.0)	2.204 (1.189- 4.087)	0.011
	Female	25(35.07)	45(64.3)	Referent	
Age group**	Less than 35	6(23.1)	20(76.9)		0.015
	35-45	53(50.5)	52(49.5)		
	More than 45	26(7.8)	19(42.2)		
Exercise	Yes	33(52.4)	30(47.6)	1.33 (0.720 – 2.467)	0.360
	No	52(45.7)	63(54.8)	Referent	
Transportation	Two wheeler	44(55.0)	36(45.0)		0.264
	Car	8(38.1)	13(61.9)		
	Auto rickshaw	31(43.7)	40(56.3)		
	Any other	2(28.6)	5(71.4)		
Physically demanding work**	Yes	67(57.3)	50(42.7)	3.201(1.653- 6.200)	<0.001
	No	18(29.5)	43(70.5)	Referent	
Working outside hospital	More often	68(46.3)	79(53.7)	0.807 (0.372 – 1.750)	0.587
	Less often	16(51.6)	15(48.4)	Referent	
Lifting /pulling heavy objects**	More often	49(56.3)	26(34.7)	3.560 (1.907 – 6.644)	<0.001
	Less often	36(34.6)	68(65.4)	Referent	
Awkward posture	More often	48(53.9)	41(46.1)	1.742 (0.952 – 3.122)	0.072
	Less often	36(40.4)	53(59.6)	Referent	
Standing	More often	73(49.3)	75(50.7)	1.593 (0.704 – 3,603)	0.261
	Less often	11(37.9)	18(62.1)	Referent	
Sitting	More often	22(40.7)	32(59.3)	0.688 (0.360 – 1.313)	0.255
	Less often	62(50.0)	62(50.0)	Referent	
Skilled Assistance	More often	16(53.3)	14(46.7)	1.325 (0.604 -2.909)	0.482
	Less often	69(46.3)	80(53.7)	Referent	

Variable	Categories	Significant injury		OR (95%CI)	P value
		Yes(%)	No(%)		
Unskilled Assistance	More often	37(52.9)	33(47.1)	1.438 (0.783 – 2.640)	0.240
	Less often	46(43.8)	59(56.2)	Referent	
Feel stressed**	More often	70(56.0)	55(44.0)	3.545(1.751 – 7.178)	<0.001
	Less often	14(26.0)	39(73.6)	Referent	
Feel uncertain/ indecisive**	More often	28(60.9)	18(39.1)	2.056(1.035 – 4.083)	0.038
	Less often	56(43.1)	74(56.9)	Referent	
Overburdened by clinical cases**	More often	51(54.3)	43(45.7)	1.833(1.009 – 3.330)	0.046
	Less often	33(39.3)	51(60.7)	Referent	
Skipping regular meals**	More often	49(59.8)	33(40.2)	2.576(1.376 – 4.602)	0.003
	Less often	36(37.1)	61(62.9)	Referent	
Use of tranquilizer**	More often	65(43.3)	85(56.7)	0.322(0.133 -0.783)	0.010
	Less often	19(70.4)	8(29.6)	Referent	
Use of restraining equipments**	More often	61(43.3)	80(56.7)	0.445(0.213 -0.931)	0.029
	Less often	24(63.2)	14(36.8)	Referent	
Hours of sleep	>6 hours	44(42.7)	59(57.3)	0.637(0.351 -1.156)	0.137
	<6 hours	41(53.9)	35(46.1)	Referent	
No of breaks	More than 1	58(50.4)	57(49.6)	1.319(0.709 – 2.454)	0.382
	1 or less	27(43.5)	35(56.5)	Referent	

** - significant at 95 percent level of confidence.

Table 4.22 Bivariate analysis: Association between Significant injury and selected continuous variables

Continuous variable	Significant injury			
	Yes		No	
	Mean (95% CI)	S D	Mean (95% CI)	S D
Age	41.95 (40.8 - 43.1)	5.07	39.85 (38.63 - 41.07)	5.71
Height in cms	164.48 (162.64 -166.33)	8.12	163.71 (161.64 - 165.78)	9.77

Continuous variable	Significant injury Yes		Significant injury Yes	
	Mean (95% CI)	SD	Mean (95% CI)	SD
Years completed in practice**	17.01 (15.82 - 18.21)	5.27	12.98 (14.29 - 15.59)	6.13
Total hours dedicated to work**	9.49 (8.88- 10.09)	2.65	8.31 (7.76 - 8.86)	2.568
Clinical cases (number)	290.69 (205.89- 375.48)	373.58	193.67 (160.36 - 226.97)	156.28
Per rectal examinations	69.69 (55.57- 83.81)	62.19	76.75 (64.95 -88.54)	55.35
Hours of exercise	3.03 (2.04 - 4.02)	4.35	1.97(1.20 - 2.73)	3.58
Hours of travel during work	3.05 (2.54 - 3.57)	2.28	2.58 (2.19 - 2.98)	1.85
Hours of work	7.77 (7.22 - 8.31)	2.40	6.98 (6.48 - 7.48)	2.34

** - significant at 95 percent level of confidence.

Summary of bivariate analysis for risk factors of physical injury

Physically demanding work activities, years of practice and total hours dedicated to work in a day were found to be significantly associated with sustaining a serious event of injury. The rate of injury was significantly higher in males than in female participants.

4.5.2 Risk factors for physical injury: Results of multivariate analysis

The bivariate analysis found significant difference between different age groups and between males and females. Multivariate analysis was done to adjust the other significant variables for different age and sex. This was achieved by performing binary logistic regression individually for each concerned variable, with significant injury as outcome and age, sex and the concerned variable as predictors. All the variables could not be simultaneously entered into the analysis due to the restrictions imposed by the limited sample size. The simple odds and age-sex adjusted odds for each category of injuries are presented below. The odds do not change greatly with this adjustment

indicating that age and sex do not make much of a difference to any of the different types of injuries.

Table 4.23 Multivariate analysis: Association between Significant injury and selected variables, adjusted by age and sex

Variable	Categories	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Physically demanding work	Yes	3.201(1.653- 6.200)	2.885(1.424- 5.846)
	No	Referent	Referent
Lifting /pulling heavy objects	More often	3.560 (1.907 – 6.644)	3.451(1.755- 6.786)
	Less often	Referent	Referent
Feel stressed	More often	3.545(1.751 – 7.178)	3.457(1.664- 7.182)
	Less often	Referent	Referent
Variable	Categories	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Feel uncertain/ indecisive	More often	2.056(1.035 – 4.083)	2.338 (1.124-4.861)
	Less often	Referent	Referent
Overburdened by clinical cases	More often	1.833(1.009 – 3.330)	1.629(0.873 – 3.040)
	Less often	Referent	Referent
Skipping regular meals	More often	2.576(1.376 – 4.602)	2.637 (1.396 – 4.982)
	Less often	Referent	Referent
Use of tranquilizer	More often	0.322(0.133 -0.783)	0.404(0.162- 1.010)
	Less often	Referent	Referent
Use of restraining equipments	More often	0.445(0.213 -0.931)	0.446 (0.206- 0.969)
	Less often	Referent	Referent

4.5.3 Risk factors for musculoskeletal disorders (MSD): Results of bivariate analysis

Any musculoskeletal disorder (MSD) that resulted in preventing the subject from performing normal activities or absence from work was considered for the outcome variable (MSD – PA and AW). This was because the prevalence of any form of MSD

was too high to render itself to meaningful analysis. The more restricted definition which resulted in a prevalence rate of 52.2 percent was used for further analysis.

Table 4.24 Bivariate analysis: Association between MSD and selected categorical variables

Variable	Categories	MSD (PA and AW)		OR (95%CI)	P value
		Yes	No		
Sex	Male	59(53.6)	51(46.4)	1.153(0.635 – 2.108)	0.634
	Female	35(50.0)	35(50.0)	Referent	
Age group	Less than 35	12(46.2)	14(53.8)		0.777
	35 - 45	57(53.8)	49(46.2)		
	Above 45	23(51.1)	22(48.9)		
Exercise	Yes	31(49.2)	32(50.8)	0.844(0.457 – 1.559)	0.587
	No	62(53.4)	54(46.6)	Referent	
Transportation	Two wheeler	48(59.3)	33(40.7)		0.287
	Car	8(38.1)	13(61.9)		
	Auto rickshaw	35(49.3)	36(50.7)		
	Any other	3(42.9)	4(57.1)		
Physically demanding work**	Yes	69(59.5)	49(41.5)	2.171(1.155 -4.080)	0.015
	No	24(39.3)	33(60.7)	Referent	
Working outside hospital	More often	80(54.1)	68(45.9)	1.439(0.656 – 3.109)	0.367
	Less often	14(45.2)	17(54.8)	Referent	
Lifting /pulling heavy objects**	More often	54(71.1)	22(28.9)	3.927(2.084 -7.403)	<0.001
	Less often	40(38.5)	64(61.5)	Referent	
Awkward posture**	More often	57(63.3)	33(36.7)	2.543(1.392 – 4.645)	0.002
	Less often	36(40.4)	53(59.6)	Referent	
Standing**	More often	85(57.0)	64(43.0)	3.486(1.451 – 8.376)	0.004
	Less often	8(27.6)	21(72.4)	Referent	
Sitting	More often	26(48.1)	28(51.9)	0.804(0.424 -1.523)	0.503
	Less often	67(53.6)	58(46.4)	Referent	

Variable	Categories	MSD (PA and AW)		OR (95% CI)	P value
		Yes (%)	No (%)		
Skilled Assistance	More often	14(46.7)	16(53.3)	0.766(0.349 – 1.680)	0.505
	Less often	80(53.3)	70(46.7)	Referent	
Unskilled Assistance**	More often	43(66.6)	28(39.4)	1.755(0.953- 3.234)	0.070
	Less often	49(46.7)	56(53.3)	Referent	
Feel stressed**	More often	77(61.1)	49(38.9)	3.634(1.828 – 7.225)	<0.001
	Less often	16(30.2)	37(69.8)	Referent	
Feel uncertain**	More often	33(71.7)	13(28.3)	3.004(1.450 – 6.221)	0.002
	Less often	60(45.8)	71(54.2)	Referent	
Overburdened by clinical cases	More often	54(57.4)	40(42.6)	1.519(0.842 – 2.741)	0.165
	Less often	40(47.1)	45(42.9)	Referent	
Skipping regular meals**	More often	59(72.0)	23(28.0)	4.617(2.448 – 8.711)	0.001
	Less often	35(35.7)	63(64.3)	Referent	
Use of tranquilizer**	More often	20(74.1)	7(25.9)	3.053(1.219 – 7.645)	0.014
	Less often	73(48.3)	78(51.7)	Referent	
Use of restraining equipments	More often	22(57.9)	16(42.1)	1.337(0.649 – 2.755)	0.431
	Less often	72(50.7)	70(49.3)	Referent	
Hours of sleep	>6 hours	50(48.1)	54(51.9)	0.673(0.371 – 1.222)	0.193
	<6 hours	44(57.9)	32(42.1)	Referent	
No of breaks	More than 1	59(51.3)	56(48.7)	0.899(0.485 – 1.663)	0.734
	1 or less	34(54.0)	29(46.0)	Referent	
Significant injury**	Yes	59(69.4)	26(30.6)	4.005(2.145 – 7.477)	<0.001
	No	34(36.2)	60(63.8)	Referent	

** - significant at 95 percent level of confidence.

Summary of bivariate analysis for risk factors for MSD: Physically demanding work, significant injury, awkward posture, Standing, feeling uncertain /indecisive, and skipping meals were found to be statistically relevant with the occurrence of MSD. Age, sex differences in MSD could not be observed in the occurrence of MSD.

4.5.4 Risk factors for musculoskeletal disorders (MSD): Results of multivariate analysis

Binary logistic regression was employed to create a multivariate model, with MSD (PA and AW) as outcome variable. The burden of having a relatively smaller sample makes it very difficult to arrive at a multivariate model, with large number of predictor variables, without subjecting the estimation of the regression coefficients to undue bias. This predicament is overcome by arriving at a parsimonious model, with fewer numbers of predictors. This model was developed by examining the associations between the identified risk factors using correlation coefficients. Those risk factors that had a statistically significant association within themselves were not included in the model. The details of this multivariate logistic regression are provided in table 4.24.

Table 4.25 Binary logistic regression: outcome- MSD (PA and AW)[#]

Predictor variables		Adjusted OR (95% C.I.)
Standing	More often	2.987 (1.215 - 7.343)
	Less often	Referent
Feels uncertain/ indecisive	More frequently	2.792 (1.308 - 5.957)
	Less frequently	Referent
Physically demanding work activities	Yes	2.168 (1.103 - 4.263)
	No	Referent

#- Cox and Snells R square- 0.118 Predictive validity-64.4%

Summary of multivariate analysis: Physically demanding work activities, remaining standing during the course of a work day, being uncertain /indecisive about procedural matters are significantly associated with the development of musculoskeletal disorders. This multivariate model could predict 64% of the outcome and was able to explain 11.8% of variation in the outcome variable.

The analysis of data generated by this research among veterinarians in Kerala, provides information regarding the nature of work, prevalence of injuries and musculoskeletal disorders, and suggests possible work related risk factors, which merit detailed discussion.

The response to surveys conducted among professionals show wide variation, but most of them do not feature a high response rate. In the reviewed publications, response rate for studies conducted among veterinarians in different countries ranges from 48 to 67 percent. The response achieved in this survey was 72 percent, although comparatively higher, it was less than 90 percent anticipated by the researcher for a mediocre sample size of 250. This placed several analytical limitations on the analysis. A relatively higher rate of response might help to portray the occupational risks of veterinary practitioners with a greater degree of validity. Yet, the possibility of a selection bias, which might arise if people who have suffered injury or MSD were more likely to respond to the study, thus inflating the estimates of prevalence, cannot be ruled out. Such biases are a greater cause of concern in case control designs than cross sectional surveys. The sampling for this study used the population frame of the directory of members of Indian Veterinary Association (IVA) (Kerala). IVA is a professional association in Kerala, which claims to have membership of most of the veterinary practitioners in the state. The sampling plan had to make substitutions for those randomly selected, but found ineligible for participating due to retirement, non-clinical nature of work and transfer out of study area. Women veterinarians comprised only 39 percent of the sample. The sex

composition of the sample is comparable to the general situation of veterinarians in Kerala. Among all the veterinarians in the three districts, from where the sample was drawn, around 65 percent are men. This is perhaps because throughout the earlier periods, women did not take to veterinary practice and the women were discouraged from taking up the profession. That this belief is changing is seen from the fact that there was a higher proportion of women (43%) among veterinarians below 45 years of age. The average duration of a work time per day, as reported by the veterinarians in this study, was 7.38 hours, out of which, 2.8 hours were spent on travelling during work.

5.1 Physical injuries

One of the important objectives of this research was to understand the nature and prevalence of physical injuries in the study population. Needle-stick injuries (22%) formed the largest proportion of injuries investigated, followed by kicking (19%) and stamping on feet (18%). Kicking and stamping are exclusively associated with handling of large animals like cows and buffalos. The percentage of people who suffered a significant injury in the past one year was 47.5 which is considerably higher than 51 percent of significant injury ever during career reported by Fritschi et al in 2006.¹⁵ Close to half of the participants (45.6 percent) required absence from work and 17.2 percent required hospitalization due to injury. This annual rate of hospitalization can be very much higher than that reported for general population in Kerala which was 10.1 for the age group of 35-59.⁴⁵ Since age of study participants range from 28 to 53 years, a direct comparison is not possible without age standardization, which was not attempted.

Significant association between several work factors and the occurrence of significant injury among veterinarians in this research has been noticed. Males and older age groups were more likely to report significant injury. As expected, those who reported

frequent use of restraining equipments were found to be important factors in reducing injury. Although several actions were found to be consistent with the occurrence of injury like lifting or pulling heavy objects, physically demanding work, feeling stressed, skipping meals etc, many of them are mere statistical associations, and thus might not be of practical relevance in preventing injuries among veterinarians, especially in the absence of supporting evidence in previous researches or a hypothesised underlying pathway of causation.

5.2 Musculoskeletal disorders

Musculoskeletal disorders (MSD) were found to be having high prevalence among veterinarians in Kerala. Neck (65%) and lower back were the most frequently affected parts of the body, followed by shoulder (56%) and hand (40%) during the past one year. This picture is similar to that of the earlier study done among veterinarians in Australia, which features 63 and 57 percent prevalence for lower back and neck respectively.²⁵ Close to half (47.8 percent) of subjects suffered from MSD which were severe enough to disrupt performing normal activities at work or home and a third experienced MSDs that resulted in absence from work (33.9 percent). Using a very conservative estimate of MSDs, the prevalence of any form of MSD was found to be 52.2 percent; indicating that one out of two veterinarians in Kerala experience some form of MSD that restricts their usual physical activities or results in absence from work.

Several work factors which might contribute to MSD were identified in this study. Frequent involvement in physically demanding work, standing, feeling uncertain or indecisive are significantly associated with MSDs in veterinarians. Lifting or pulling heavy objects, awkward posture and stress are also some of the factors that were found relevant in the analysis. Actions at work which involve high intensity forces, sometimes

awkward postures, psychosocial conditions that create stress etc have already been established in previous researches as relevant risk factors for MSD.²⁴

Based on the results of this study, several possibilities of intervention could be suggested. Making available adequate number of assistants to veterinarians can be good measure in reducing the burden of physically demanding activities. Good diagnostic capabilities, training, clear guidelines for all procedures etc can be implemented to help to reduce the uncertainties concerning veterinary practice. Systematic interventions to tackle stress at work place can also be another footstep in reducing MSD among veterinarians.

5.3 Methodological issues in this research

The participants were required to recollect the events over period of one year to satisfactorily answer the questionnaire given to them. Because of this the findings could be undermined with issues of recall. Although such an effect could not be ruled out, an attempt was made minimize it by restricting such questions to adverse events such injury and chronic illnesses. However, it needs to be stated that recollecting major adverse events by the participants can be subjected to ‘telescoping’, resulting in a higher estimation of such events. A shorter duration of interest, although would have addressed these issues, might fail to meaningfully demonstrate the true burden of injuries among veterinary professionals, as these events do not occur frequently and evenly.

All the information provided by this study is self reported by participants. No methods of validation have been undertaken to assess the accuracy of information. The validity of self reported workload in epidemiological investigations have been assessed and disputed. However, professionals like veterinarians have to document their daily activities at work and monthly reports are required to be submitted to higher authorities.

It was expected that the activities reported by the veterinarians in the study might correspond with their monthly reports. Moreover, since veterinarians also possess medical knowledge, they are considered better equipped to assess and report their injuries and illnesses.

5.4 Strengths and limitations of the study

Strengths

- This study collected quantitative data on veterinarians who are spread throughout 3 districts in the state to provide estimates of the prevalence of physical injuries and musculoskeletal disorders among them.
- There have been very few studies on this topic in India before.

Limitations

- The response rate (72%) was lower than the expected rate of 90 percent and this created analytical limitations.
- MSDs can result from exposures that happen over a long period of time. It is not possible to fully account risk factors through cross sectional designs.
- The information collected on injuries is based on self report. Therefore, we cannot rule out any systematic biases inherent to such data.
- The participants were required to recollect the events over period of one year to be able to satisfactorily answer the questionnaire. Because of this the findings could be undermined with issues of recall.

5.5 Conclusions

The extent of significant injuries reported in this study (47.5 percent) is high, far more than that previously reported in other settings. A major component of these injuries consisted of needle stick jabbing, stamping on foot and kicking. Needle stick jabbing among trained professionals may not be due to lack of training but possibly due to uncontrolled animals whom the veterinarians were called upon to treat. The same can be said for other two injuries, stamping on foot and kicking (by the animals being treated). There is an urgent need for restraining equipment to be made available to practicing veterinarian and this would help to reduce the burden of physical injuries significantly. Given that more than a quarter of the veterinarians had to be hospitalized at least once during their careers and close to a third suffered injuries that required an absence of more than five days from work, it may be advisable to consider a comprehensive injury protection insurance plan for veterinarians that would help to pay for care and support during such phases.

The prevalence of injuries and MSDs are relatively high (52.2%) among veterinary practitioners in Kerala, compared to those of many other countries, and also other comparable professional groups. This is very high by any standards and requires measures to prevent its occurrence. As currently working veterinarians are likely to be already affected, a curative package that serves to alleviate the pain is also necessary. Physically demanding work activities, remaining standing during the course of a work day, being uncertain/ indecisive about procedural matters most often can contribute to the development of musculoskeletal disorders. Good diagnostic capabilities, training, clear guidelines for all procedures might help to reduce the uncertainties concerning veterinary practice.

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Appendix 1

Participant Information Sheet

Physical injuries and musculoskeletal disorders (MSD) in veterinarians in Kerala: A study on occupational risk factors

INFORMATION SHEET

Sir/ Madam,

My name is Dr. Govind Raveendran Pillai. I am a student of Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Trivandrum, doing my Masters degree in Public Health (MPH). As part of my academic requirement I am doing a study in the field of occupational health. I have chosen to study the prevalence of physical injuries and musculoskeletal disorders (MSD) and associated occupational risk factors in veterinary practitioners in Kerala.

PURPOSE OF THE STUDY

It has been acknowledged world over that veterinarians are among a group of professionals who engage in activities which make them highly susceptible to job related injuries and illnesses. A veterinarian's job is physically demanding, and often involves an elevated risk of accident. Although there have been many studies conducted in developed nations, there is limited information on this occupational health hazard among veterinarians in India. Therefore it is my intention to undertake a study to understand the prevalence of physical injuries and musculoskeletal disorders (MSD) and associated occupational risk factors in veterinary practitioners in Kerala.

PROCEDURE

As part of my study, I intend to collect information from a group of randomly selected veterinarians who currently works as clinicians in the field, using a self administered questionnaire. You are one of those randomly selected. Hence I have approached you and requested your participation. Participation in this study will require you to fill up a questionnaire (7 pages) and will have to provide information regarding your work related activities. This might take approximately 20-30 minutes of your time.

RISK & DISCOMFORTS

Approximately 30 minutes of your time will have to be utilised for participating in this study and some of the questions being asked are of a personal nature, but relevant to an understanding of the risks you are exposed to during the course of your work=

BENEFITS

There are no direct benefits to you for participating in this study. However, it is hoped that your participation will help enhance understanding about job related injuries and illnesses of veterinarians in Kerala and that would in turn contribute to better designed policies and prevention strategies.

CONFIDENTIALITY

All information provided will remain confidential and will only be used for the purpose of this research. The information will only be reported as group data with no identifying information. All data, including questionnaires will be kept in a secure location and only those directly involved with the research will have access to them. The information will only be kept till the completion of the study after which the questionnaires will be destroyed.

PARTICIPATION

Participation in this Study is voluntary and you can choose not to answer any question or all of the questions. You may choose to withdraw your participation from the Study at anytime. However, your participation in the Study will be greatly appreciated. Your refusal to participate in this study will not affect any present or future services that you receive from Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST).

In case you need more information about this study or have any questions later, you may contact me or my guide Dr. Mala Ramanathan, Additional Professor, AMCHSS or Dr. Anoop Kumar T, Member, Institutional Ethics Committee (IEC), SCTIMST on the following addresses and phone numbers.

Dr. Govind Raveendran Pillai, MPH Scholar, Achutha Menon Centre for Health Science Studies, SCTIMST Thiruvananthapuram Ph- 09847707404 Email- govind@sctimst.ac.in	Dr. Mala Ramanathan, Additional Professor, Achutha Menon Centre for Health Science Studies, SCTIMST Thiruvananthapuram Ph- 0471 2524234 Email- mala@sctimst.ac.in	Dr. Anoop Kumar T, Scientist 'F' Molecular Medicine, BMT Wing, SCTIMST, Poojapura, Thiruvananthapuram Ph 0471-2520256 Email-anoop@sctimst.ac.in
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Appendix 2
Informed consent form

INFORMED CONSENT

I have read and have understood the information provided above about the research study. I have had an opportunity to ask questions and, if I have done so, they have been answered. I consent to participate in this research study on my own free will.

.....

.....
Name of Participant

.....

.....
Signature

.....
Date

.....

.....
Signature of Researcher

.....
Date

Appendix 3

Self administered questionnaire

SI No.....

Physical injuries and musculoskeletal disorders (MSD) in veterinarians in Kerala: A study on occupational risk factors

SELF ADMINISTERED QUESTIONNAIRE

Instructions

- Please write the answers in block letters where space/boxes for writing are given.
- Please mark your answers with a tick (√) where numbered options are given.
- Please tick (√) only one option unless otherwise instructed.
- Please read the instructions along with the questions carefully and answer all questions you find relevant.

1.	Date [DD/MM/YYYY]	/ / 2011
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Please fill in the following details about yourself.

2.	Name
3.	Address
4.	Age [IN COMPLETED YEARS]	<input type="text"/> <input type="text"/> years
5.	Sex [PLEASE TICK (√) THE APPROPRIATE ANSWER]	1. Male 2. Female
6.	Your body height [IN CENTIMETERS]	<input type="text"/> <input type="text"/> <input type="text"/> cms

The following questions relate to your daily routine. Please read the questions and instructions carefully and answer.

7.	How many hours did you sleep on night of your last working day? [PLEASE TICK (✓) THE MOST APPROPRIATE ANSWER]	1. Less than 5 hours 2. 5-6 hours 3. 6-7 hours 3. 7-8 hours 4. more than 8 hours
8.	Do you routinely engage in exercise / leisure time physical activities like aerobics, yoga, swimming, walking, running etc? [PLEASE TICK (✓) THE APPROPRIATE ANSWER]	1. Yes 2. No
9.	How many hours of exercise/leisure time physical activity do you engage in per week? [PLEASE WRITE THE ANSWER IN THE BOXES PROVIDED] [IF NONE, PLEASE WRITE '0']	[HOURS] [MINUTES] <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center;"> </div> <div style="border: 1px solid black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center;"> </div> </div>
10.	What type of exercise/leisure time physical activity do you engage in? [PLEASE TICK (✓) THE APPROPRIATE ANSWER. YOU CAN TICK MORE THAN ONE OPTION]	1. No exercise/physical activity 2. Running 3. Brisk walking 4. Yoga 5. Aerobics 6. Swimming 7. Any other, please specify.....

The following questions relate to your veterinary practice. Please read the questions and instructions carefully and answer.

11.	How many years have you completed in veterinary practice? [COMPLETED YEARS SINCE REGISTRATION. PLEASE WRITE THE ANSWER IN THE BOXES PROVIDED]	<div style="border: 1px solid black; width: 60px; height: 30px; display: flex; align-items: center; justify-content: center;"> </div>
12.	How do you describe the location of your place of practice? [PLEASE TICK (✓) THE MOST APPROPRIATE ANSWER]	1. Urban 2. Semi urban 3. Rural

How often do the following happen during your work?

[PLEASE TICK (✓) **ONLY ONE ANSWER IN EACH ROW**]

	Always (100%)	Most often (80%)	Frequently (60%)	Sometimes (40%)	Rarely (10%)	Never (0%)
20. Working outside hospital/office	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
21. Lifting or pulling heavy objects	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
22. Awkward or uncomfortable posture	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
23. Standing	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
24. Sitting	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
25. You receive skilled assistance	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
26. You receive unskilled assistance	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
27. You feel stressed	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
28. You feel indecisive/ uncertain	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
29. You feel overburdened by clinical cases	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
30. Skipping regular meals (breakfast/lunch)	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
31. Use of tranquilizers for restraining animals	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never
32. Use of restraining equipments while examining animals	1. Always	2. Most often	3. Frequently	4. Sometimes	5. Rarely	6. Never

The table given below seeks information about work related injuries. Please fill in the concerned details on any work related injuries encountered during your practice anytime during the past **12 months**. [PLEASE TICK (✓) **ONLY ONE ANSWER IN EACH ROW**]

Nature of injury	No injury	Once	Twice	Thrice	Four times	Five times	If >5 please specify the number of times you have been injured
33. Any type of injury during work	0	1	2	3	4	5	
34. Injury occurred during handling animals	0	1	2	3	4	5	
35. Injury requiring medical attention	0	1	2	3	4	5	
36. Injury requiring absence from work for one or more days	0	1	2	3	4	5	
37. Injury requiring hospitalisation	0	1	2	4	4	5	

The table given below seeks information on the type of injuries sustained. Please fill in the details regarding the type of injury that you might have sustained in the **past 12 months**. [PLEASE TICK (✓) **ONLY ONE ANSWER IN EACH ROW**]

Type of injury	No injury	Once	Twice	Thrice	Four times	Five times	If >5 please specify the number of times you have been injured
38. Dog bites	0	1	2	3	4	5	
39. Dog scratches	0	1	2	3	4	5	
40. Cat bites/scratches	0	1	2	3	4	5	
41. Kicking	0	1	2	3	4	5	
42. Horn injury	0	1	2	3	4	5	
43. Crushing against wall or hard objects	0	1	2	3	4	5	
44. Stamping on foot	0	1	2	3	4	5	
45. Needles jabbing on fingers/hands etc	0	1	2	3	4	5	
46. Cut by sharp objects like scalpels/ scissors	0	1	2	3	4	5	
47. Any type of fracture	0	1	2	3	4	5	
48. Sprains or strains	0	1	2	3	4	5	
49. Joint dislocations	0	1	2	3	4	5	

The table below helps you to provide us the details of musculoskeletal problems like back pain, neck pain etc which you might have. Please read questions 44 to 48 and tick (✓) your answer.

[YOU CAN ANSWER **MORE THAN ONE ANSWER** IN EACH ROW OR COLUMN. YOU NEED TO ANSWER QUESTIONS 46 TO 48 ONLY IF ANY OF THE ANSWERS FOR 44 OR 45 ARE ‘YES’.]

Body parts	50. Have you at any time during the last 12 months had any trouble such as pain, ache or discomfort in any part of your body mentioned below?	51. Have you had any trouble (such as pain, ache or discomfort) during the last 7 days in any part of your body mentioned below?	52. During the past 12 months have you been prevented from carrying out normal activities (eg. job, house work, hobbies) because of this trouble?	53. Have you had any trouble that lasted for more than 3 months duration? (during last 12 months)	54. Have you been absent from work anytime during the past 12 months due to any of these problems?
a) Neck	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
b) Shoulder	1. Yes 2.No	1. Yes 2.No	1. Yes 2.No	1. Yes 2.No	1. Yes 2.No
c) Lower back	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
d) Upper back	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
e) Wrist or hand	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
f) Elbow	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
g) Arm	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
h) Hip or thigh	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
i) Knee	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
j) Ankle or foot	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No

[THE FOLLOWING QUESTION NEEDS TO BE ANSWERED **ONLY IF** ANY ONE OF THE ANSWERS TO QUESTIONS 50 OR 51 IS ‘YES’ i.e. ONLY IF YOU ARE SUFFERING FROM ANY MUSCULOSKELETAL PROBLEMS LIKE BACK PAIN, NECK PAIN, SHOULDER PAIN ETC. IF ALL ANSWERS ARE ‘NO’, PLEASE SKIP THIS QUESTION AND GO TO THE NEXT QUESTION.]

Have you made any changes described in the table below, to your daily routine or your work practices **after** experiencing any musculoskeletal problems like back pain, neck pain, shoulder pain etc (as asked in questions 50 and 51) [PLEASE TICK(✓) ‘YES’ IF YOU AGREE WITH THE GIVEN STATEMENT. TICK (✓) ‘NO’ IF YOU DO NOT AGREE.]

55.	I started routinely doing exercise/ physical activity like aerobics, yoga, swimming, walking, running etc	1. Yes	2. No
56.	I changed the type of vehicle or mode of transport which I used to travel during work	1. Yes	2. No
57.	I started to prefer not to take up cases which were physically demanding, such as dystocia, prolapse of uterus, large animal surgeries etc.	1. Yes	2. No
58.	I started using more help from assistants	1. Yes	2. No
59.	I considered quitting clinical practice	1. Yes	2. No
60.	I sought medical attention and treatment	1. Yes	2. No

The questions given below seek information about any work related injury or accident which you might have suffered **ever during your whole career as veterinary practitioner.**

61.	Have you suffered any work related injury or accident that resulted in your hospitalization ever during your career? [PLEASE TICK (✓) THE APPROPRIATE ANSWER]	1. Yes	2. No
62.	Have you suffered any work related injury or accident that resulted in absence from work for more than 5 days, ever during your career? [PLEASE TICK (✓) THE APPROPRIATE ANSWER]	1. Yes	2. No

Please provide information about the different animal related activities and procedures you have to undertake as part of your work.

[PLEASE FILL IN THE FOLLOWING TABLE BY WRITING THE NUMBER OF ANIMAL RELATED ACTIVITIES/ PROCEDURES WHICH YOU HAVE UNDERTAKEN **DURING THE LAST MONTH.**]

Activity/ Procedure	Total number during last month	
63. Cases involving clinical examination of animals		
64. Per- rectal examinations		
65. Dystochia attended		
66. Correction of prolapsed uterus/ vagina		
67. Surgery less than 40 minutes duration	Large animals	
	Small animals	
68. Surgery more than 40 minutes duration	Large animals	
	Small animals	
69. Downer cows attended		
70. Hoof trimming/examinations		

[END OF THE QUESTIONNAIRE]

Thank you for your time and forbearance.

