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The highly incident causes of accidental poisoning in camels and sheep in Saudi Arabia and their economic impact

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Abstract

Objective: This study aimed to adequately investigate the most frequent causes of poisoning in camels and sheep in the Kingdom of Saudi Arabia (KSA).

Methods: Appropriate data were carefully collected from the recorded animal poisoning cases in the Veterinary Health and Monitoring Department, Ministry of Environment, Water and Agriculture (MEWA), during the period (from 2018 to 2019). All recorded cases were accurately diagnosed with a case history and reported clinical signs as well as definitive confirmation by laboratory analysis of the collected samples.

Results: From the recorded data of 852 camel and sheep poisoned cases, the results showed that the primary causes of animal poisoning in Saudi Arabia were Cyanogenic glycosides (42.25%), Pesticides (26.76%), Mycotoxins (18.8%), and Drugs (12.2%). These cases were recorded only in 5 geographical regions (Riyadh, Qassim, Makkah, Northern borders, and Eastern province)

Conclusion: Accidental toxicity in camel and sheep in KSA was mainly caused by Cyanogenic glycosides, Pesticides, Mycotoxins, and Drug toxicity. The frequent reasons for possible toxicity should be minimized through active veterinary extension.

Keywords: Animal Poisoning, Cyanogenic glycosides, Pesticides, Mycotoxins, Drugs, Saudi Arabia

1. Introduction

The local populations of camels and sheep found in Saudi Arabia in 2017 were estimated to be around 485926 and 9328455 heads, respectively. (FAOSTAT, 2019). They are adapted for survival and performance under harsh environmental conditions (Gaughan, 2011). The nature of camel and sheep desert habitat in Saudi Arabia makes them undergo hunger, thirst, and other stress factors, especially during the extended dry season. Under these stress factors, camels and sheep become more liable to some diseases and poisoning conditions which may adversely affect their reproductive and productive performances (Kumar et al., 2012; Ramendra et al., 2016; Bhardwaj et al., 2018).

Poison in common is a dose-dependent potential hazard that adversely affects the standard physiological functions and may threaten the life of living beings (Descotes and Vial, 1994; zhu et al., 2017). The manner of livestock poisoning is frequently associated with the environment imposed by human (Balagangatharathilagar, et al., 2006; Lightfoot and Yeager, 2008; Buttke, 2011). Potential sources of xenobiotics that adversely affect animals include contaminated feed, water, air, and soil (Donner et al., 2010). The most common causes of animal toxicity include chemical toxins, such as heavy metals, pesticides, and drugs and biological toxicants, for example, mycotoxins, poisonous plants, snake bites, and scorpion stings (Modrá and Svobodová, 2009).

The pattern of animal poisoning in any given country may vary depending upon the environmental conditions, type of agriculture, and the allowed chemicals for animal use like pesticides (Larkin and Tjeerdema, 2000; Mandal, 2017). Published data about animal poisoning in the Kingdom of Saudi Arabia (KSA) are rare. Some of these studies reported an outbreak in camels and indicated that Salinomycin was toxic to camels with a high mortality rate (Abu-Samra and Shuaib, 2017).
Animal toxicity may cause severe economic losses (Iheshiulor et al., 2011; Soares et al., 2018). Due to the limited obscure data about animal intoxication in KSA, the present study was carried out to investigate the

most frequent causes of accidental animal poisoning in KSA.

2. Materials and methods

2.1. Data collection

The data were carefully collected from officially recorded animal poisoning cases in the Veterinary Health and Monitoring Department, Ministry of Environment, Water, and Agriculture (MEWA), Riyadh during the selected period (2018-2019). The total number of cases was 852. The case reported descriptive data including animal species, type of poison, clinical and laboratory data, and geographic area were retrieved. These data were manipulated solely for research purposes while the personal data of animal farms and owners maintained confidentially. All the published causes were confirmed by submitting different samples obtained from particular cases to Riyadh veterinary laboratory. The economic impact of different types of toxicity was calculated according to the economic value of animal species in the Saudi animal market. It was calculated for dead animals due to the specific cause of toxicity.

2.2. Diagnosis of poisoning

All investigated cases were accurately diagnosed by history, signs, and laboratory diagnosis of poisoning. The history and signs of poisoning were accurately observed and recorded by the veterinary specialists team from MEWA as soon as the animal owners notify the veterinary authority in their place. Postmortem examination was done for the dead cases followed by the collection of appropriate samples from deceased and alive animals as well as environmental samples (e.g. water, feed, drugs, pesticide containers). Laboratory diagnosis was carried out by Riyadh Veterinary Laboratory, MEWA for confirmation of the possible cause of poisoning. Cyanogenic glycosides, pesticides, and mycotoxins were analyzed using Agilent Technologies LC/MS6460 triple Quad, and 7000D GC/MS triple quad. According to the method described by Anastassiades et al., 2003.

3. Results

The resulted data showed that all the recorded poisoning cases were located in 5 regions in KSA, these data were expounded in Table (1), presenting the number of poisoned cases in relation to animal species, cause of poisoning, and geographical area. The most common causes of sheep and camel poisoning in KSA were cyanogenic glycosides (42.25%), pesticides (26.76%), mycotoxins (18.8%), and drugs (12.2%). The main source of cyanide poisoning was feeding on the immature stage of Andropogon sorghum and Sorghum-sudan grass plants (according to the recorded data obtained from the animal's owners' complains).

Pesticides poisoning was ranked as the second main cause of farm animal poisoning in KSA. The sources of toxicity include inhalation of pesticide vapors during its agricultural application in the nearby areas or orally during its veterinary use for ectoparasites treatment. Different types of pesticides were recorded. They included Diazinon (49.68%), cypermethrin (26.08%), cyhalothrin (19.87%), malathion (0.62%), carbofuran (0.62%), methomyl (1.24%) and cyprodinil (1.86%) (Fig1).

Regarding the mycotoxins as the third cause of farm animal poisoning in KSA, the most prevalent types were aflatoxicosis and ochratoxicosis, they were mainly observed in sheep cases. Drug poisoning was the fourth common cause of animal poisoning in KSA. The recorded cases of drug toxicity were mainly due to Off-label use of veterinary drugs administration for unapproved species (e.g Salinomycin), followed by overdose medication (e.g Xylazine), route of administration, and rare cases were recorded due to drug allergy (e.g Iron dextran preparations). The species incidence of the observed drug toxicoses was mainly confined to sheep and camels with percentages of (93.26%) and (6.74%), respectively.

Concerning the economic impact of the most incident causes of animal toxicity in KSA, the recorded deceased cases by MEWA in KSA revealed the average monetary losses from cyanogenic glycosides, pesticides, mycotoxins, and drug toxicity. They were 52,000, 55,000, 53,000 and 20,416 SAR, respectively. The highest monetary losses were due to pesticide poisoning, while the lowest one was due to drug toxicity.

Tabel.1: Number of poisoned cases in relation to animal species, regional area, and the cause of toxicity

Cause of toxicity	Riyadh		Qassim		Makkah		Northern borders (Al Hudud Asch-shmalyia)		Eastern province (Asch-Sharqiya)		Total No. of cases
	camel	sheep	camel	sheep	camel	sheep	camel	sheep	camel	sheep	
Cyanogenic glucosides	0	265	0	15	0	0	0	80	0	0	360
Pesticides	45	68	0	0	0	0	3	80	32	0	228
Mycotoxins	0	0	0	0	0	160	0	0	0	0	160
Drugs	5	0	1	0	1	0	0	97	0	0	104
Total No.	51	333	1	15	0	160	3	257	32	0	852

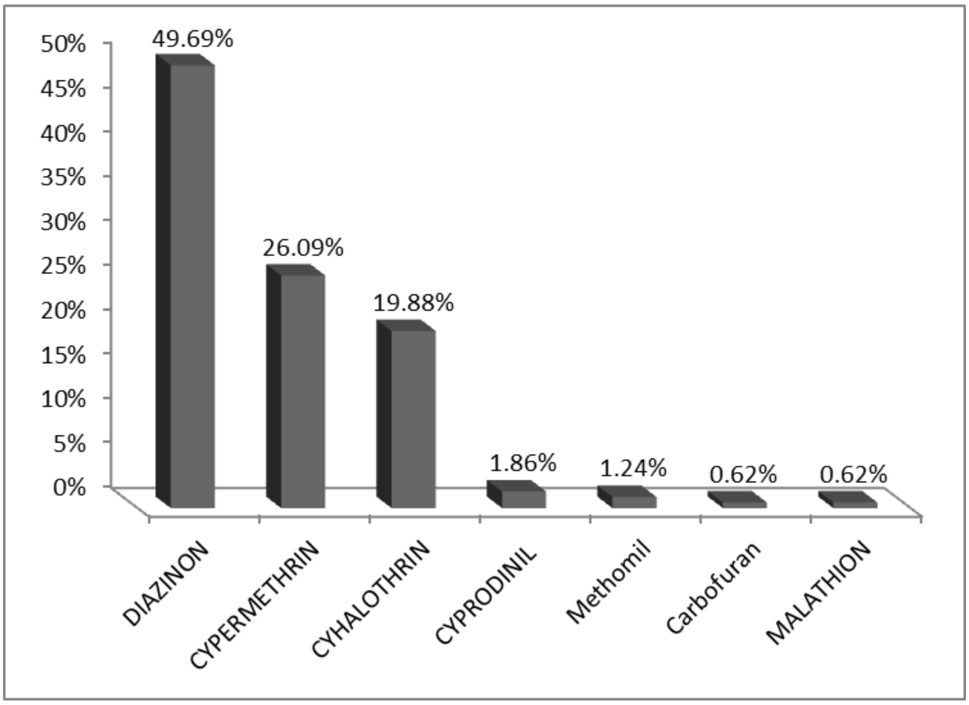

Fig.1: The chart showing the percentage of 7 chemical types of pesticides caused camel and sheep poisoning in KSA.

Discussion

Potential toxins are considered a significant impact on animal wealth resulting in either acute or chronic diseased cases. Besides, animal toxicity may transfer the toxin residue to humans through animal products (Kan, 2009). Despite some animals exposed to xenobiotics could be apparently healthy; some of these potential toxins adversely affect animal production and reproduction. Biotransformation of xenobiotics occasionally produces corrupting oxidative intermediate products which represent the chief source of reactive oxygen species (ROS) (Deavall et al., 2012; Nasr et al., 2017). It could be a risk factor for more critical illness initiated with oxidative stress and DNA damage (Oberley, 2002). For that, accurate assessment of toxicants hazards on animals and humans should be considered.

Cyanogenic glycosides, pesticides, mycotoxins, and drugs represented the most prevalent causes of animal poisoning in KSA. The intensive cultivation of sorghum in KSA has been progressively increased in the last years (FAOSTAT, 2019) which can tolerate adverse environmental conditions such as elevated temperature. The sorghum and Sudan grass in common are local plants naturally containing cyanogenic glycosides. These glycosides are non-toxic chemicals but are converted to a toxic agent after being decomposed, thereby producing hydrocyanic acid (HCN) (Conn, 1991) and become toxic for both animals and humans. Cyanide is one of the most rapidly acting poisons (Gracia and Shepherd, 2004) which may cause acute animal deaths. Ruminants have been intoxicated with cyanide as a toxic ingredient of various plants (Puls et al., 1978; Tegzes et al., 2003). Successful conversion of cyanogenic glycosides into HCN is potentiated by ruminal microflora and ruminal pH as well as it is affected by plant age (Vetter, 2000). In KSA, the green fodder traders frequently resort to harvesting sorghum plants at a premature age which increases the risk of cyanide poisoning in farm animals.

Pesticides poisoning in camels and sheep was confirmed in KSA, with an increased incidence of diazinon followed by other types like cyhalothrin and cypermethrin (Meligy et al., 2019). The animal poisoning with pesticides might be linked with the misuse of veterinary pesticides products and sometimes with agricultural use (Sharpe et al., 2006; Berny, 2007). In KSA, Diazinon is banned as a chemical insecticide for agricultural use and restricted for veterinary use. However, some of the animal breeders traditionally apply it out of its proper way. They drench diazinon orally for animals with the intent to treat gastrointestinal worm infestation, it is termed in Saudi "Aljara". Such misuse of pesticides would represent a repeated reason for animal toxicity in KSA.

The third determined cause of sheep and camel poisoning in KSA was mycotoxins. The most prevalent types were aflatoxin and ochratoxin which could be attributed to the high temperature which favors the growth of *Aspergillus spp* (Diekman and Green, 1992). The mold growth on animal feed may be positively enhanced with some unethical practices of green fodder traders in KSA who compress the green feed with high humidity. The effects of mycotoxins on livestock are mainly chronic causing reduced feed intake, production, and fertility (Storm et al., 2008), however, high doses of mycotoxins or ingestion of more than one type, may cause acute signs even deaths (Chen et al., 1982; Cook et al., 1986).

Therapeutic products represented a primary cause of animal toxicity (Xavier et al., 2002). Drug toxicity in sheep and camels was the most prevalent fourth cause for poisoning in KSA. It may be acute or chronic with adverse effects ranging from mild signs of potential health problems to life-threatening effects (Bastianello et al., 1996; Poortinga and Hungerford, 1998). The off-label use of veterinary medications seemed to be the crucial reason for these possible toxicities. Drug toxicity in camels had an economic impact in KSA (Al-Wabel, 2012).

Conclusion

In this study, we reported the most common four causes of camels and sheep poisoning in KSA which were cyanogenic glycosides, pesticides, mycotoxins, and drug toxicity. The recorded cases of animal toxicity were confined to 5 regions (Riyadh, Qassim, Makkah, Northern borders, and Eastern province). Knowing the leading causes of possible toxicity in farm animals in KSA allow us to adequately demonstrate the favorable conditions of occurrence and possible mode of poisoning and how to properly avoid further cases of poisonings.

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