



Incidence of dog bite in Al Muthanna governorate including injuries and its clinical healing in the human

Karima Al Salihi ^{1*}; Mustafa Hamed ¹; Hussien Majeed ¹

¹ College of veterinary medicine/ Al Muthanna University/ Iraq

ARTICLE INFO

Received: 10.09.2017

Revised: 29.09.2017

Accepted: 19.011.2017

Publish online: 09.12.2017

*Corresponding author:

Emailaddress:

kama-akool18@mu.edu.iq

Abstract

There are elevations in the number of stray dogs in different governorates in Iraq. Moreover, the number of people who are interested in keeping dog for life purpose has also risen. Every year, there are a number of populations contacted to animal bites throughout the country. Wounds due to dog bites are popular in different human ages, but are more common in children. A high rate of these dog bites affect different body locations, however, upper extremities are more common site. There is scarce information

describing dog bites in Al Muthanna governorate, in addition to describe its healing process. Therefore, this study intends to report the incidence of dog bites in Al Muthanna governorate and to describe the clinical healing process of pet dog bites in their owner arm. The authors retrospectively reviewed the records of dog bites who seeked emergency department at Al Muthann hospital in Samawah city from January 2016 to November 2016 (totally 11 months). During the study period, there were 176 people's emergency department visits for dog bites. Among the 176 person with dog bites, there were 41 female and 135 male with percentages of 23.295% and 76.704% respectively. Moreover, the incidence of dog bites was varied between the victims age group, there were 0 (0%), 5(3%), 57 (32%), 88 (50%) and 26 (15%) for less than one year, 1-4 years, 5-14 years, 15-45 years and more than 45 years respectively. The total population of Al Muthanna governorate was 775 X 1000 according to total estimation of Iraq (April 2009 IMF estimate). Accordingly, the total incidence rate of dog bites in Al Muthanna governorate/ 100.000 people was 22.709 % for the total population. One patient revealed clinical signs of rabies with percentage of incidence 0.568% for the total dog bites. Moreover, the percentage of rabies for total population for Al Muthanna governorate was 0.129/ 100.000. The time and healing process of dog bites extended for 3 weeks and left scar centrally depressed area. In conclusion, for the author's knowledge this is the first study that approved the incidence of dog bites in Al Muthanna governorate. The higher incidence percentages of dog bites occur between the patients of age group 15-45 year and followed by 5-14 years. Moreover, the incidence rate of dog bites was higher in male than female. The study approved the incidence of rabies in one case between the total dog bites. The Authors recommended another future retrospective study that reviewed more years to determine the actual situation of the dog bites that act as a serious health problem in Al Muthanna as well as in another Iraqi governorates.

To cite this article: Al Salihi K A; Mustafa Hamed; Hussien Majeed. (2017). Incidence of dog bite in Al Muthanna governorate including injuries and its clinical healing in the human MRVSA. 6; (3): 13-24.

DOI: [10.22428/mrvsa.2307-8073.2016.00632.x](https://doi.org/10.22428/mrvsa.2307-8073.2016.00632.x)

Keywords: dog bite, incidence, Al Muthanna governorate, Samawah, Rabies, scar

Introduction

Dogs is considered a part of human history inconsideration before the recoded verbalism. It is actually the history of partnership between the human being and dogs (*Canis lupus familiaris*). The first domesticated dogs were in Mesopotamia (2150-1400 BCE), that so far regarding to the area of what is recently the Republic of Iraq. Mesopotamia included the Euphrates and Tigris river systems and is regarded by many to be the cradle of civilization (Livingstone, 1988). The dog appeared in the Epic of Gilgamesh. The ancient arts and statue expressed the companions of one of the popular goddesses of the region, moreover, it showed also that the goddess Innana (Ishtar) travels with 7 prized hunting dogs wearing the invented collar and leash that prior to Egypt. The Suluki dog (golden) was appeared at the Sumerian city of Uruk at 3300 BCE and cylinder seal from Nineveh. The laws of Eshunna, a Sumerian city in ancient Mesopotamia, were reported the first observations of disease that occurred due to dog bites and compatible with rabies. The Eshunnian laws, written almost 4000 year ago, and caution of fines for owners of uncontrolled dogs (Crazy or mad dogs) that bite human (Theodorides,1986). Moreover, the law of the old Babylonian period (1894 -1595 BC) addressed the damage that caused by animals especially the dog bites (Zietsman, 2000).

Human-dog partnership is established on a human demand for help with chase and shepherding, and for the early warning security system. Recently, there are significant global increased in the interest of people in having a dog. Pet dogs give love, happiness and companionship for millions of people around the world, however accident and a health hazard occurred (Aristarhos & Darem, 2014). The wonderful friendship between dogs and humans is at an indefinite time interrupted by dog bites that can be highly serious.

Dog bites are most common health matter, causing morbidity and in scarce cases can cause mortality. Bites of the pet dog are serious for several different reasons. The oral cavity of the pets harbor several microorganisms that can cause serious infectious diseases and life-threatening infection, when deposited deep into tissue. Mouth microorganisms linked with sharp teeth that can either rupture or breaking though flesh easily create a dangerous combination.

There are 10 million people who are bitten by animals worldwide each year, and there are 55.000 people infected with rabies according to the WHO data. Dog bite wounds are usually considered as complex injuries and contaminated with poly microbial inoculum. In India, WHO survey showed that dog was the major causative source of which 62.9 and 37.1 were stray and pets dog respectively (Sudarshan, 2005).

In United States, bites of animal are an immensely popular health matter and leading to considerable morbidity and in scarcely cases mortality (Mcheik *et al.*, 2000; Borud and Friedman, 2000). The majority of animal bite injuries are caused by dogs, while cat bites are the second (Mitchell *et al.*, 2003). Annually, eight hundred thousand (800.000) Americans look medical care for dog bites, where 386.000 need treatment in an emergency unit (Lackmann *et al.*, 1992). Moreover, in United States, the dog bites alone commissioned one billion Dollars per year (Marcy, 1982).

In Iraq, there are high number of free- roaming ownerless dog. There are no planned sterilization campaigns to control dog population, however, culling of dog has been used traditionally. Some of these dogs are attack human especially the children and farm animal and bite them. Moreover, and due to the security issue, in Iraq, nowadays high percentage of Iraqi people and farmers keeping dogs keeping one or more dogs from different breeds. These dogs are subject to tough

training regime to attack the robbers and the suspected people, and ultimately, these dogs may become vicious and attack their owners.

Horton *et al.*, (2013), reported the incidence of dog bites in Baghdad. They found less than 1000 dog bites that reported between years 2002 to 2004. The incidence rate was 20(95% CI 18.76-21.24) bites / 100,000 person, based on a population estimate of 5 million (Roberts *et al.*, 2004). However, the dog bites incidence rate in Baghdad was increased later in years between 2007 and 2010. The reported average was 3300 bites per year with annual incidence of 46 (95% CI 44.27-47.40) bites per 100.000 person with a population estimate of 7.2 million.

The incidence rate of dog bites overall Iraq was 57 bites per 100.000 population in 2007 with total reported dog bites were 17000, however, the real number might be higher. Most reported dog bites were reported from Salah-eldin, Baghdad, Babil, Theqar, Missan, Wasit, Basra, Diwania, with total number of 845, 4610,1050,713,512,1430, 2400,722 respectively for each governorate.

However, no previous report or literature has been reported regarding the incidence of dog bites in Al Muthanna governorate. In addition, review of literatures, did not revealed any record that reported the clinical healing process of dog bites in Iraq. Consequently, this study intends to study the incidence of dog bites in Al Muthanna governorate and to describe the clinical healing process of pet dog bites in their owner arm.

Mechanisms of dog bite and its wound features

Dog bite can cause a serious health problems. There are three mechanisms for dog bite. These includes:

1. Trauma: It is one of the first sequela of a bite that impose the tissue. Skin surface abrasion, penetrated injuries, varying degrees of laceration loss of tooth, truncation, and tearing down of skin and hair are the most common traumatic effects of dog bite. Moreover, severe hemorrhage due to broken blood vessel may occur (Cherry, 2014).
2. Infection: Different pathogenic microorganisms can be introduced into the bite. Pathogenic microorganisms can arise from the mouth of the biter dog, but the microorganism that exist normally on the skin or hair of the injured person may also promote and enhance the infection. The more common microorganisms that have been reported and causing infections after dog bite, included: *C. tetani*, *C. perfringens*, *Pasteurella sp*, *Streptococcus sp*, *Staphylococcus sp*, *Neisseria sp*, *Fusobacterium sp*, *Bacteroides sp*, *Porphyromonas sp*, *Prevotella sp*, and *Capnocytophaga sp*. (Hassan Aziz *et al.*, 2012). Moreover, *Capnocytophaga Canimorsus* Septicemia Caused by a Dog Bite was reported by Hammoud *et al.*, (2011). This organisms is more dangerous due to its ability to produce sepsis especially in immune-compromised individuals. It is also well known that any dog bite can result in local infection and cellulitis and even serious conditions such as sepsis, meningitis, osteomyelitis and septic arthritis.
3. Rabies: Dogs bites most commonly transfer rabies virus to human. According to WHO, approved that more than 95% of human death due to rabies result from transporting virus via infected dogs bite (WHO, 2016). The clinical signs of rabies include hydrophobia, red eyes, jerky behavior, foaming from the mouth, self-mutilation and growling (WHO, 2016).

In Iraq, human rabies incidence were reported every year from all governorates public health office due to stray dog bite. There was significant increase in rabies cases annually between 2003 and 2005. Moreover, the data collected between 2001 and 2010, revealed an

average of 17(SD 6.9) with variation in the incidence between each years. The human rabies incidence in 2009 was 0.89 death / million population.

Approximately, 40% of the inhabitants was under 15 years of age. Moreover, the disease was reported in rural areas than urban areas. The male reported high rabies incidence (8 cases) than female (1 case) (Horton *et al.*, 2013).

Bite of dog may lead to a series of wounds, including laceration, deep-seated open injuries, perforated wounds, crush wounds shredding away one of a body part.

Dog bites are considered crushing wounds due to their exceptionally strong jaws and rounded teeth. Historically, animals teeth are made to kill and tear flesh therefore can cause a lot of damage. Adult dogs can do 200–450 psi (pounds per square inch) of pressure with their jaws. Damage to muscle, tendons, vessels, nerves and even bone are all possible concerns with any dog bite. The trained dog such as police dog can related with more severe biting power that vary from civilian untrained dog bites. Hutson *et al.*, (1997) reported a 705 dog bites inflicted at prison amber patients in Los Angeles between years 1988-1995 with 19.3% complications. The percentages were 4, 7, 1.9 and 5% for bone fractures and cortical penetration, vascular wounds, nerve injury, and infections respectively in addition to tendon injuries and joint interruption. Moreover, 20 to 35 person, many of them children killed due to dog attacks every year in United States (Hutson *et al.*, 1997). The dog bites can cause three types of soft tissue injuries: Punctures, Lacerations and Avulsions with or without real tissue lack. A classic dog bite results in mixture of puncture-type injuries with neighboring rupturing of tissue that called as the (Hole and Tear) effect (Panagiotis, 2009). Smash injuries were also seen in different degree in dog bites due to bite dynamics. The existence of a confined spot of entry, poor drainage and injection of organisms to depth of the tissue lead to develop the clinical implications in dog bite. These factors generate the suitable environment for proliferation of anaerobic bacteria.

Wounds result from dog bite are much vary from other kinds of tissue ruptures and lacerations. Dog like to shake their head during attack and bite, leading to rupturing wounds and loss of flesh and neighboring tissues. A dog bites frequently leave severe and permanent scar tissue. Highly visible areas of wounds were seen on the face, lips ears, nose, neck and trunk of dog bite children. These wounds need multiple, long term plastic surgery strategy and extensive care to reduce or remove the scar (Speirs *et al.*, 2015).

Methods

This retrospective study was conducted in Al Muthanna / Samaw hospital / Iraq. The current study approved from research committee in the college of veterinary medicine / Al Muthanna University. Dog bites data were reviewed from hospital records for 11 months that extended between December 2015 to January 2016. The medical records also were reviewed for demographical parameters including: the sex and the age of the victim, injuries features, ownership status of the dog (unknown / known to the victim/stray dog), site and location of the bite on the body (upper extremity, lower extremity, face, trunk, the time from wound to presentation to the clinic and the management and treatment received (antibiotics, surgical intervention, treatment). The time and steps of healing of one patient with his own dog bite on its upper extremity followed up and this patient was signed the consent form.

Results

During the study period (from January –November / 2016) there were 176 of different age group emergency department visits for dog bites (Table.1).

Table.1: Shows the number of dog bites incidence according to months and patient demographic factor.

Months	Victims Age groups										Total Male	Total Female	Total
	Less than 1 year		1-4 years		5-14 years		15-45 years		More than 45 years				
	M	F	M	F	M	F	M	F	M	F			
January	0	0	0	0	7	2	11	3	1	1	19	6	25
February	0	0	0	0	3	0	5	1	0	0	8	1	9
March	0	0	0	0	1	0	4	4	3	1	8	5	13
April	0	0	0	1	5	0	7	1	1	1	13	3	16
May	0	0	0	0	6	0	9	0	2	2	17	2	19
June	0	0	0	0	4	1	4	4	3	6	11	11	22
July	0	0	0	1★	8	0	4	2	1	0	13	3	16
August	0	0	0	0	1	1	7	2	0	0	8	3	11
September	0	0	1	0	6	1	3	1	0		10	2	12
October	0	0	1	0	7	0	4	2	4	1	16	3	19
November	0	0	0	1	3	0	9	1	0	0	12	2	14
Total	0	0	2	3	52	5	67	21	14	12	135	41	176

★ This patient developed signs of Rabies

The incidence of dog bites was varied between different months of the study, among 176 dog bites, there were 25 (19 M+ 6 F), 9 (8 M +1 F), 13(8M +5 F), 16 (13M+3 F), 19(17M+2F), 22 (11M+11F), 16(13M+3F), 11(8M+3F), 12(10M+2F), 19 (16M+3F) and 14(12M+2F) that occurred in January, February, March. , April, May, June, July, August, September, October and November respectively (Figure .1).

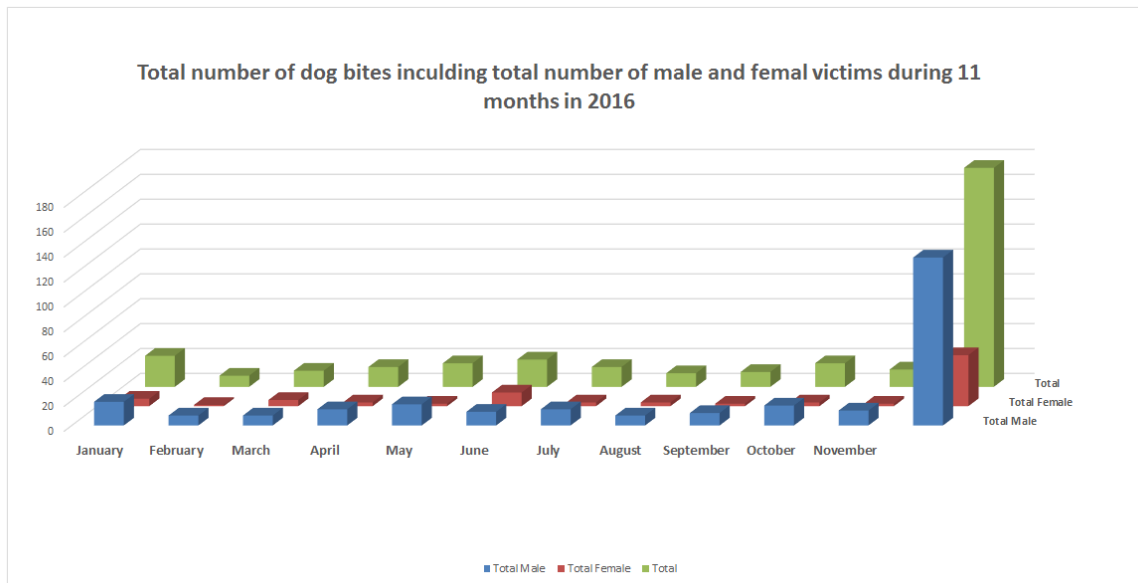


Figure.1: Shows the number of dog bites in each month of the study period.

Among the 176 person with dog bites, there were 41female and 135 male with percentages of 23.295% and 76.704% respectively (Figure.2).

**Percentages of dog bites incidence
distributes according to sex (Male and
female)**

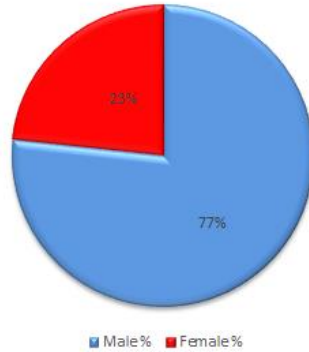


Figure. 2: Shows the incidence of dog bites distributed according to the sex.

The incidence of dog bites was varied between the victims age group, there were 0 (0%), 5(3%), 57 (32%), 88 (50%) and 26 (15%) for less than one year, 1-4 years, 5-14 years, 15-45 years and more than 45 years respectively (Figure.3 A&B).

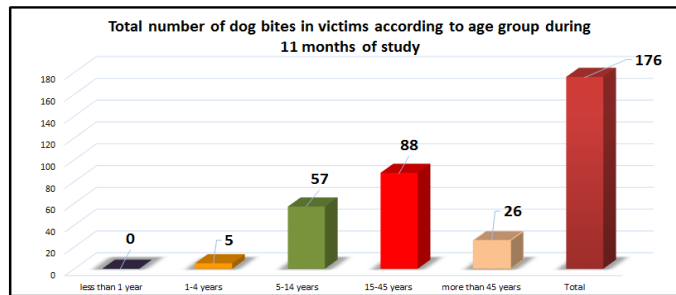


Figure 3 A: shows the percentages of incidence according to victims age group during 11 months.

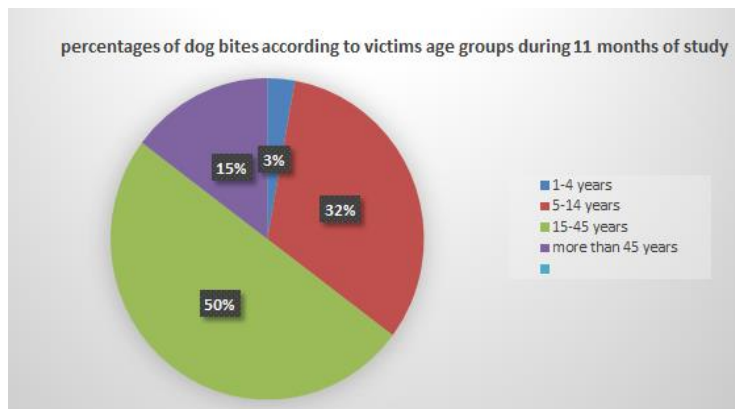


Figure.3 B: The Pie chart shows the percentages of incidence according to victims age group during 11 months.

The total population of Al Muthanna governorate was 775X1000 according to total estimation of Iraq (April 2009 IMF estimate). The total incidence rate of dog bites in Al Muthanna governorate/ 100.000 person was 22.709 % for the total population (Figure.4).

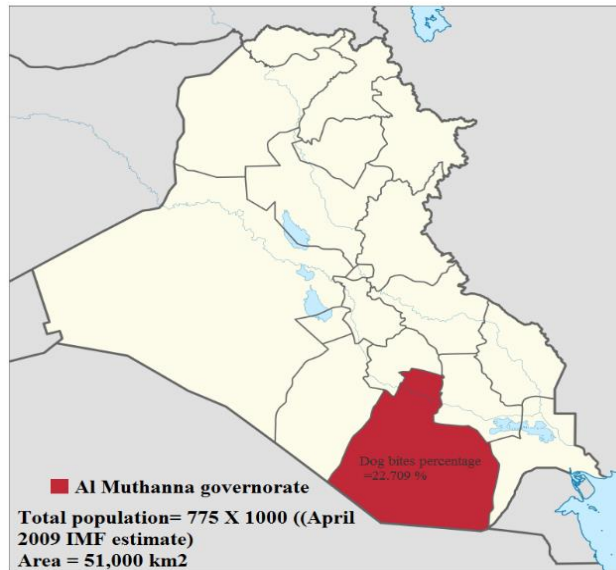


Figure.4: Shows the total incidence rate of dog bites in Al Muthanna governorate/ 100.000 person for the total population

Among 176 victims, only one female patients within age group (1-4 years) developed clinical signs of Rabies and died. This dog bite happened at July (Table 1) with percentage of rabies incidence 0.568 for the total dog bites. Moreover, the percentage of rabies for total population of Al Muthanna governorate was 0.129/ 100.000.

All victims revealed multiple location of dog bites and the majorities were occurred in the upper extremities, lower extremities facial, trunk and genital area. All victims were hospitalized and treated with tetanus, rabies prophylaxis and antibiotics administrated for all victims.

Among 176 victims one patient was bitten from his own dog. The bite located on the right arm. The time and steps of healing process was followed up in this patient. The first presentation of the patient revealed 3 different sized injuries on the right arm 2 injuries was small and shallow and the third one was deep and tringle in shape (Figure 5).

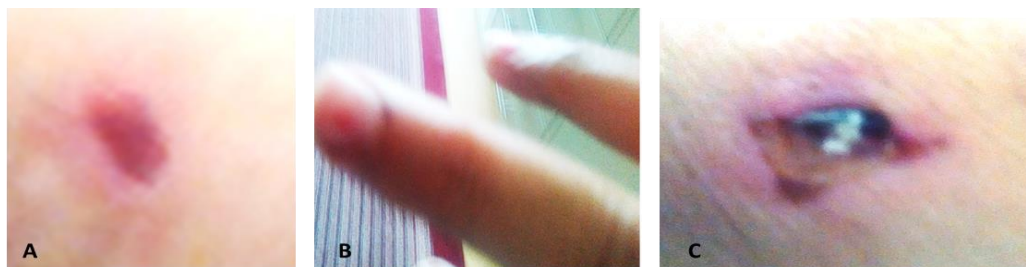


Figure. 5: Shows injuries at the first presentation after the dog bites. The Injuries was on different locations of the victim right upper extremity. A & B: small injuries. C . Large deep wound appeared as triangle shape surrounded by hyperemic zone and full thickness rupture of the skin

The patient was suffered from severe pain and unable to move his hand and he thought that there was a damage of the nerve.

Three days later, the wound showed signs of inflammation and accumulation of pus. One week later, with systemic antibiotic administration the pus disappeared and wound minimized in size (Figure. 6). The wound minimized and scar tissue formation occurred after 2 weeks. Three weeks later the scar dropped and left a centrally depressed red area (Figure.7).



Figure. 6: Shows deep wound 3 days after the dog bites. The wound revealed accumulation of pus in A& B. C: Show the progress of healing and absence of the pus after antibiotic treatment with minimization the size of the wound after one week.

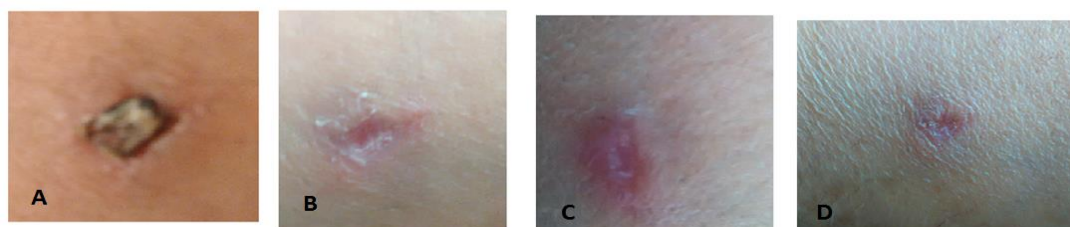


Figure. 7: Shows healing steps of deep wound weeks after dog bites. The wound A: Reveals minimizing and scar tissue formation after 2 weeks. B & : Reveal the falling down of the scar leaving depressed red area, 3 weeks after bite. D: Reveals the small scar formation that appeared as depressed centrally. AA

Discussion

In this study, the incidence of dog bites was reported in Al Muthanna governorate. Al Muthanna governorate is the second largest governorate in Iraq, called after the 7th-century Arab general Al-Muthanna Ibn Haritha. It is one of the Middle Euphrates governorate and extends over 51,000 km² and total population of 775X1000 according to total population estimation of Iraq (April 2009 IMF estimate). It is located in the south of the country, bordering Saudi Arabia. It is bordered Najaf and Diwaniya governorates to the north and Dhi Qar on the east. Samawah is much related to the Uruk the ancient Sumerian-Babylonian city, probably the origin of the name Iraq.

Dog bites are recognized as a dangerous health problem because of its high incidence around the world (Centers for Disease Control and Prevention, 2001; Shipkov *et al.*, 2013; Quinlan & Sacks, 1999; Schalamon *et al.*, 2006; Voelker, 1997; Nygaard & Dahlin, 2011). Among domestic animal bites, 80-90% were dog bites with 2 % of these bites need admission to hospital (Benson *et al.*, 2006). Kids and teenagers are probably more than adults to maintain dog bites with plenty effect of their arm and upper limbs (Kahn *et al.*, 2003). In all dog bites, there were increasing in the risk of acute infection and result due to improper and delay in the treatment of bite-accompanied injuries (Esposito *et al.*, 2013).

The results of the current study revealed that the dog bites register in Al Muthanna governorate during all months of 2016. The total number of dog bites during 11 months of the study represented 176 persons with variation in the number of cases between each month. The results of this study report that the total incidence percentages / 100.000 person of dog bites in Al Muthanna governorate was 22.709 % for the total population. This result is incompatible with previous study that reported the dog bites in several Iraqi governorates (Horton *et al.*, 2013). The total number of dog bites in the current study was 176 in compare with previous study that reported higher incidence number 845, 4610, 1050, 713, 512, 1430, 2400 and 722 in Salah-Eldin, Baghdad, Babil, Thiqar, Missan, Wasit, Basra, and Diwania respectively in 2007 (Horton *et al.*, 2013). However, the results of the current study are in agreement with the results of previous studies in regard to the higher incidence of dog bites in kids and teenager and in male than female 1:3.29 (Male 76.704% and female 23.295%). The dog bites occurred in higher percentages in the age group 15-45 years with total number 88 (50%) followed by age groups 5-14 years, more than 45 years , 1-4 years and less than 1 year with total number 57 (32%), 26 (15%), 5(3%) and 0 (0%) respectively. The previous study in Iraq also reported higher Male, female ratio 9.5 to 1, in 2007, while the more age affected between 2.5 year and 24 years (Horton *et al.*, 2013). The result of the current study also reported one case of rabies in female patients within age group (1-4 years). This female developed clinical signs of Rabies and died. The total incidence rate of dog bites in Al Muthanna governorate / 100.000 person was 22.709 % using estimate of 775 X 1000 total Al Muthanna population. Moreover, the current study revealed 0.568% human rabies incidence for the total dog bites. The results of the current study is incompatible with previous report (World Bank, 2008) that reported the incidence of human rabies in Iraq during 2009 with estimated death rate for 0.89 /1.000.000 according to a population estimate of 30 million.

While this result is higher than the rabies rate in dog bites 0.13% / 100.000 that reported previously in 2007 in other governorate in Iraq (Horton *et al.*, 2013).

The data of the current study revealed multiple location of dog bites in all victims with majorities of injuries that occurred in the upper extremities, lower extremities facial, trunk and genital area. This results are in agreement with previous studies of (Joshua *et al.*, 2015) who reported that 96% of patients suffered from injuries to single parts of their bodies. However, 46.6% on face/ trunk and 35.5% on the lower limbs. This results also similar to Schalamon *et al.*, (2006), who reported 357 dog bites in Austria. The reviewed data regarding the patients of the current study approved that all victims were hospitalized and treated with tetanus, rabies prophylaxis dose, in addition, to antibiotics administrated for all victims. These treatment and management processes are compatible with procedures mentioned in most literatures that deal with the dog bites treatment plan (Nygaard & Dahlin, 2011; Kahn *et al.*, 2003).

The follow up observation of the time and steps of healing process of dog bites in one patient reported different sized injuries on the right arm. Some of these injuries were small and shallow while the other was deep and tringle in shape. The healing process long for three weeks and revealed different gross pathological changes and eventually minimizing in the size and closing of the wound by the scar tissue that dropped and left a centrally depressed red area three weeks after bite. All these changes are similar to dog bites healing process reported previously by other researcher that reported the scar formation in the majorities of dog bite and need further plastic surgery plan (Speirs *et al.*, 2015);Panagiotis, 2009; Hutson *et al.*, 1997).

In conclusion this study approved the incidence of dog bites in Al Muthanna governorate. The higher incidence percentages of dog bites occur between the patients of age group 15-45 year and

followed by 5-14 years. Moreover, the incidence rate of dog bites was higher in male than female. The study approved the incidence of rabies in one case of the total dog bites. The Authors recommended another future retrospective study that reviewed more years to determine the actual situation of the dog bites that act as a serious health problem.

References

Aristarhos Seimenis & Darem Tabbaa. (2014). Stray animal populations and public health in the South Mediterranean and the Middle East regions. *Veterinaria Italiana* 2014, 50 (2), 131-136. doi: 10.12834/VetIt.48.134.3.

Benson LS, Edwards SL, Schiff AP, Williams CS, Visotsky JL. (2006). Dog and cat bites to the hand: treatment and cost assessment. *J. Hand Surg.* 31A: 468–73.

Borud LJ, Friedman DW. (2000). Dog bites in New York City. *Plast Reconstr Surg.* 106:987Y990.

Centers for Disease Control and Prevention (2001). Nonfatal dog bite-related injuries treated in hospital emergency departments – United States. *MMWR Morb. Mortal. Wkly Rep.* 2003; 52: 605–10.

Cherry, James (2014). Feigin and Cherry's textbook of pediatric infectious diseases – Animal and Human Bites, Morven S. Edwards. Philadelphia, PA: Elsevier/Saunders. ISBN 978-1-4557-1177-2; Access provided by the University of Pittsburgh.

Daniel L. Horton, Mashair Z. Ismail, Eman S. Siryan, Abdul Raheem A. Wali, Husam E. Ab-dulla, Emma Wise, Katja Voller, Graeme Harkess, Denise A. Marston, Lorraine M. McElhinney, Salah F. Abbas, Anthony R. Fooks. (2013). Rabies in Iraq: Trends in Human Cases 2001–2010 and Characterisation of Animal Rabies Strains from Baghdad. *PLOS Neglected Tropical Diseases.* www.plosntds.org. 7; 2, e2075: 1-7.

Esposito S, Picciolli I, Semino M, Principi N. (2013). Dog and cat bite-associated infections in children. *Eur. J. Clin. Microbiol. Infect. Dis.* 32: 971–6.

Hassan Aziz, Peter Rhee, Viraj Pandit, Andrew Tang, Lynn Gries, and Bellal Joseph, (2015). The current concepts in management of animal (dog, cat, snake, scorpion) and human bite wounds. *Journal of Trauma and Acute Care Surgery* · 78, (3):641-648. DOI: 10.1097/TA.0000000000000531.

Hutson HR, Anglin D, Pineda GV, Flynn CJ, Russell MA, McKeith JJ (1997). Law enforcement K-9 dog bites: injuries, complications, and trends. *Ann Emerg Med.* 29(5):637Y642.

Human rabies: 2016 updates and call for data. World Health Organization. (2016). Weekly epidemiological record. 17 February 2017, 92th YEAR / 17. No 7, 2017, 92, 77–88.
<http://www.who.int/wer>

Joshua Speirs, James Showery, Marwa Abdou, Miguel A Pirela-Cruz and Amr A Abdelgawad. (2015) Dog bites to the upper extremity in children. *Journal of Paediatrics and Child Health* 51 1172–1174.

Kahn A, Bauche P, Lamoureux J. (2003). Dog Bites Research Team. Child victims of dog bites treated in emergency departments: a prospective survey. *Eur. J. Pediatr.* 162: 254–8.

Lackmann GM, Draf W, Isselstein G, Toillner U. (1992). Surgical treatment of facial dog bite injuries in children. *J Craniomaxillofac Surg.*20: 81Y86.

Livingstone A (1988). The Isin Dog House Revisited. *Journal of cuneiform Studies* 40: 54–60.

Marcy SM. (1982). Infections due to dog and cat bites. *Pediatr Infect Dis.* 1(5):351Y356.

Mcheik JN, Vergnes P, Bondonny JM. (2000). Treatment of facial dog bite injuries in children: a retrospective study. *J Pediatr Surg.* 35:580Y583.

Mitchell RB, Nan̄ez G, Wagner JD, Kelly J. (2003). Dog bites of the scalp, face and neck in children. *Laryngoscope.*113 (3):492Y495.

Panagiotis K. (2009). Stefanopoulos. Management of Facial Bite Wounds. *Oral Maxillofacial Surg Clin N Am.* 21: 247–257.

Nygaard M, Dahlin LB. (2011). Dog bite injuries to the hand. *J. Plast Surg Hand Surg.* 45: 96–101.

Roberts L, Lafta R, Garfield R, Khudhairi J, Burnham G (2004). Mortality before and after the 2003 invasion of Iraq: cluster sample survey. *Lancet* 364: 1857–1864.

Quinlan KP, Sacks JJ. (1999). Hospitalizations for dog bite injuries. *JAMA.* 281: 232–3.

Shipkov H, Stefanova P, Sirakov V et al., (2013). Acute paediatric bite injuries treated on inpatient basis: a 10-year retrospective study and criteria for hospital admission. *J. Plast Surg Hand Surg.* 47: 467–71.

Schalamon J, Ainoedhofer H, Singer G et al., (2006). Analysis of dog bites in children who are younger than 17 years. *Pediatrics.* 117: e374–9.

Sudarshan MK. (2005). “Assessing burden of rabies in india: WHO sponsored national multicenter rabies survey”. IJCM, 30(3). E-article (<http://www.ijcm.org.in> on Monday, August 18, 2014, IP: 14.96.105.160).

Theodorides J (1986). Histoire de la Rage. In: Masson, editor. Cave Canem. Paris. pp.289.

Voelker R. (1997). Dog bites recognized as public health problem. JAMA. 277: 278–80.

World Bank (2008). Data tables. In: Iraq household socio-economic survey IHSES - 2007: tabulation report. Washington D.C.: The Worldbank.

<http://documents.worldbank.org/curated/en/2008/12/10192867/iraq-householdsocio-economic-survey-ihses-2007-tabulation-report-vol-2-3-data-tables>. Accessed: 25 July 2012.

Zietsman JC. (2000). VICIOUS DOGS A CASE STUDY FROM 2000 BC TO AD 2000. Akroterion 45 75-87.