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Appraisal of dog bite cases in Federal Medical Centre, Umuahia Abia state – Nigeria

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Abstract

Dog bite cases pose a major public health threat in Nigeria and other nations of the world. Millions of people are bitten by dogs, and most cases are fatal when bitten by rabid dogs. This study evaluated dog bite cases in Umuahia, Abia State, Nigeria. It is a retrospective study on the clinical records of dog bite patients managed between 2016 to 2018 at the Federal Medical Centre Umuahia. Out of 98 reported cases of dog bites, there was a higher incidence rate of (65.3%) among the male victims than females (37.7%). 19.4% of the cases were victims of less than 15 years of age. Lower limb (59.2%) was the major site of bite cases. 58.2% of the offending dogs were owned while 41.8% were stray dogs. Only 31.6% of offending dogs had up-to-date anti-rabies's vaccination. Clinic records showed that 52% of the patients were presented within 24hrs of the incidence at the hospital. Use of herbal balms (48%) was the most pre-hospital treatment received by dog bite victims. 4 victims had confirmed rabies case. Wound sustained by victims included open wound, lacerations, bruises and avulsion. Treatment pattern was based on evaluated risk of exposure of victims. In conclusion, dog bite cases in this study occurred more in males and adults with mostly owned dogs being involved in the reported cases. Most victims of dog bite cases at the Centre promptly presented their cases for medical consultation. Public awareness is required on the need to avoid provocative dog bites, prompt hospital visitation when bitten by a dog, and there is a need for dog owners to vaccinate their dogs annually against rabies.

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Introduction

Dog bite in human is a global public health issue that is associated with the dog, a domestic animal that is known to be a companion of man. Human –dog companionship that has been in existence has profited mankind through the resourceful potentials of dog to meet security, game, haunting as well as the social needs of man (Gilchrist *et al.*, 2008).

Despite the symbiotic relationship that existed between the duo, the dog's natural instinct that leads to bite remains intact (Kreisfeld & Harrison, 2005). Dog bites lead to a crushing-type wound because of their rounded teeth and strong jaws. Victims suffer from psychological and emotional trauma in addition to physical injuries sustained

from bites (Dwyer *et al.*, 2007). The bite in humans results in open soft-tissue injury and fracture of varying degrees of severity (Kreisfeld & Harrison, 2005). This soft –tissue injury however, varies from scratches to avulsion and sometimes these injuries may request reconstruction (Kreisfeld & Harrison, 2005). The worst consequence of dog bites is rabies although not all bites result in rabies (Alabi *et al.*, 2014).

Rabies is a viral disease that is responsible for severe irritation of the brain in humans and other warm-blooded animals (WHO, 2013). Rabies virus, which belongs to the Lyssavirus genus of the *Rhabdoviridae* family, causes fatal encephalitis (Hampson *et al.*, 2015). This age long neglected and vaccine-preventable infection accounts for almost 60,000 deaths annually (WHO, 2017), with almost 100% case fatality rate (Ameh *et al.*, 2014). The potential risk of transmission is the domestic dogs (*Canis familiaris*); and are the most significant sources of infection with more than 94% of human cases occurring due to a bite from a rabid dog (Kassiri *et al.*, 2014). This is, however, credited to pitiable non-compliance to anti-rabies vaccination of dogs. Dog meat processors handled dogs without taking tolerable precaution, an anomaly that exposes them to bite or salivary contamination (Mshelbwala *et al.*, 2013). This zoonotic infection causes conspicuous apprehension in the life of the patients and their relatives.

The outcome of exposure to rabies virus depends on several factors, including the severity of the wound, the location of the bite on the body, the quantity and variant (genotype) of virus inoculated into the wound(s), and the timeliness of post-exposure prophylaxis (PEP), (WHO, 2018). The prevalence of unvaccinated dogs in Nigeria and most developing countries calls for one to preempt the possibility of rabies in every victim of a dog bite (Alabi *et al.*, 2014). According to WHO (2018), the following categories describe the risk of rabies virus exposure based on the type of contact with the animal suspected of having rabies. The risk of exposure will determine the indicated PEP procedure: Category I (Non-bite, no PEP if reliable case history is available): low risk. Category II (Abrasion or scratch): moderate risk requires wound management and administration of anti-rabies vaccine immediately and Category III (Single or multiple transdermal bites or scratches. Contamination of mucous membrane with saliva (i.e. licks) Licks on broken skin): high/severe risk necessitate Wound Management, Administer rabies immunoglobulin and anti-rabies vaccine immediately.

There are documented reports of dog bite cases in Aba, by Otolorin *et al.* (2014), dog bite cases reported to the zonal veterinary clinic, Umuahia by Mshelbwala *et al.* (2013), detection of rabies antigen in the saliva and brains of apparently healthy dogs slaughtered for human consumption in Abia State by Mshelbwala *et al.* (2013) and incidence of dog bite cases in humans in Umuahia Local Government Area by Nwoha & Ugwoke (2017). With the obvious presence of a high population of unvaccinated dogs; the prevalence of 5% rabies antigen in the saliva of healthy dogs; 6% of offending dogs with the classical presentation of rabies and improper housing to control bites and rabies contributed to high endemicity of rabies in the study area. However, information on the evaluation of dog bite cases at the Federal Medical Centre (FMC), Umuahia is scanty. This study sought to investigate documented dog bite cases reported to this tertiary health facility in order to ascertain the possible outcome based on their treatment regimen.

Materials and Methods

Study area

The Federal Medical Centre Umuahia, is a tertiary health-care provider located at Umuahia. It is the common referral for serious medical conditions in the state. It receives patients from all parts of the State and other adjoining States.

Umuahia, the study area, is one of the seventeen Local Government Areas of the state and the capital city of Abia State. It is located along the rail route that lies between Port Harcourt (to Umuahia's South) and Enugu city (to its north). It lies between latitudes 5° 34' N and 5° 42' E; and Longitude 7° 24' N and 7° 34' 30" E. It is bounded to the north by Isuikwuato LGA, to the northeast by Bendel LGA, to the South-east by Ikwuano LGA, to the South by Isiala-Ngwa north LGA and share a common boundary with Imo State to the west. Dogs were possessed for security and source of meat in the study area (Nwoha & Ugwoke, 2017).

Study design

The study was a 3-year retrospective study conducted at the Children Emergency/pediatric ward, Adult accident/Emergency ward and the Community Medicine Department of FMC Umuahia, Abia State from January 2016 to December 2018. Authors identified all clinically diagnosed dog bite cases during the period, from admission and discharge books. Purposive sampling was done based on the fact that dog bite cases were handled in this centre. The dogs that were involved in these

deaths were killed and buried. Also, there was no laboratory confirmatory diagnosis.

Data collection

The clinical records of patients managed for dog bite related injuries and rabies over a 3-year period were identified and extracted. Data extracted include age, sex, site of bite, time of presentation at the hospital, presenting symptoms, pre-hospital treatment received, hospital treatments given and the outcome of such treatments. A case definition for rabies by the records was based on clinical signs.

Data analysis

Data obtained were analyzed with descriptive statistics using SPSS IBM version 23 and are presented in frequency and tables.

Results

A total of 16,322 patients visited the hospital through the children and accident emergency wards from 2016 to 2018. Of these numbers, 98 cases of dog bite related injuries were seen and managed

during the three-year study period constituting 0.60% of the total consultations.

Of the 98 reported cases of dog bite, 19 (19.4%) were victims of 0 –15 years of age, 25 (25.50%) were victims of 16 – 30 years and 54 (55.10%) were victims greater than 31 years of age, respectively. Reported cases of bite were more in males (65.3%) than females (34.7%). Furthermore, the results revealed that 33.7% of the victims were presented with wounds, 20.4% presented with bleeding; 16.32% with cut/scratching while 4% with signs associated with central nervous system (CNS) (Table 1).

Case report of victims at the hospital showed that 51 (52%) of the victims were presented within 24 hours of sustaining the dog bite, while 39 (39.8%) within days and 8 (8.2%) were presented several weeks after sustaining the bite. Less than 50% of the victims in this study presented themselves for herbal treatment before going to hospital for proper and effective management of their cases.

The pattern observed at the bite site showed majority (59.2%) had their bite on the lower limbs, 33(33.7%) presented with the upper limb and only 7 (7.1%) had their bite location at the trunk and buttocks (Table 2).

Breed- wise, the hospital records categorized dogs into foreign and local breeds. The distributions showed that 55 (56.1%) are of an exotic breed while 43 (43.9%) were local breed. Regarding the history of previous bite cases by the dogs, 26 (26.6%) had a history of bite cases, 31 (26.6%) showed that the dogs had no history of bite cases, and 41 (41.8%) cases were unknown (Table 2). Out of the total number involved in dog bite cases, 57 (58.2%) offending dogs were owned (confined) and 41 (41.8%) were found to be stray dogs. The report also showed that most of these victims were attacked as they visited homes. Records of the vaccination status of these dogs involved in the bite revealed that 54 (55.1%) had never been vaccinated, only 31 (31.6%) of the owned dogs had up-to-date anti-rabies vaccination (Table 3). In contrast, 26 of the owned dogs were not vaccinated

Table 1: Socio-demographic characteristics and symptoms of dog bite victims

Variables	Frequency	Percentage (%)
Age range		
0 - 15	19	19.40
16 – 30	25	25.50
> 31	54	55.10
Total	98	100.0
Sex		
Male	64	65.30
Female	34	34.70
Total	98	100.0
Presented sign/symptom		
Wound	33	33.70
Bleeding	20	20.40
Cut/scratching	16	16.32
Fever	11	11.22
Pain/swelling	14	14.28
CNS involvement	4	4.08

Table 2: Distribution of site of bite and dog’s previous history of bite cases

Site of dog bite	Total No. of Cases (%)	Dog’s previous history of bite cases (%)
Lower limb	58 (59)	Has history 26 (26.6)
Upper limb	33 (34)	No history 31 (31.6)
Trunk & buttock	7 (7)	Unknown 41 (41.8)
Total	98 (100)	98 (100)

against rabies. The treatment plan instituted at the hospital was based on the risks of exposure to bite. Twelve (12.2%) of the victims in category 1 exposure received post-exposure prophylaxis (PEP) of washing of the intact skin. All the victims that had wound received wound care following dog bite. Wounds were washed with soap and irrigated with water or saline; and antiseptic was used to treat the wound as well. A total of 79 (80.6%) patients were administered prophylaxis against tetanus, human diploid cell vaccine (HDCV) in 82 (83.7%) in both categories II (45) and III (37); and human rabies immune globulin (HRIG) administered to 1 (1.0%) patient in category III. Other supplementary medications such as antibiotics 82 (83.7%), analgesic 76 (77.6%), intravenous fluid (9.9%) and vitamins (61.2%) were equally administered to victims (Table 4).

From the records studied, immunization schedule was completed in 59 cases, 23 were lost to follow-up treatment, 12 had no ARV administration and 4 victims lost their lives. They had clinical signs of rabies and died within 2–3 days of admission (Table 5). For this study, human deaths due to rabies occurred only in 2018.

Discussion

Dog bite cases in this study over the period under consideration reveal a total prevalence of 0.60%. This figure is however higher than 0.24%; 0.31% and 0.44% reported by Kahn *et al.* (2003); Schalamon *et al.* (2006) at Graz, Austria; Nwoha & Ugwuoke (2017) in Umuahia Local Government Area of Abia State in their respective studies. The variation in this study may be because the data generated are only from those that reported their cases to this hospital. This prevalence, on the other hand is lower than 0.89% and 1.5% reported by Dwyer *et al.* (2007) and Ezra *et al.* (2017) at the pediatric trauma unit at the Red Cross War Memorial Children's Hospital, Cape Town, South Africa and child health unit, Ekiti Teaching Hospital Ado-Ekiti respectively. This study showed that most of the offending dogs involved in the bites were owned dogs, which is similar to the findings of earlier reports of Abubakar & Bakari (2012) and

Table 3: Distribution of dog’s vaccination status

Variables	Frequency	Percentages
Vaccinated	31	31.6
Non-revaccinated	13	13.3
Unvaccinated	54	55.1
Total	98	100

Table 4: Pattern of treatment administered to victims based on exposure category of treatment at hospital

	Categories of exposure			Total
	Category I	Category II	Category III	
Washing & wound care/ dressing	12	40	25	75
Tetanus toxoid	0	43	36	79
Anti-rabies (HDCV)	0	45	37	82
HRIG	0	0	1	1
Antibiotics	8	40	42	90
Analgesics	0	50	26	76
Vitamins	4	26	30	60
Intravenous fluid	0	3	6	9

Table 5: Treatment outcome of dog bite case presented to Umuahia FMC

Treatment	Outcome				Total
	Discharged	Lost to follow up	Dead		
ARV (HDCV) Administration	Yes	58	23	-	81
	No	12	-	4	16
HRIG Administration	Yes	1	-	-	1
	No	-	-	-	-
Total		71	23	4	98

Mshelbwala *et al.* (2013). This result indicates that even owned (confined) dogs are actively involved in the transmission of rabies via dog bites. If confinement is not properly monitored, it will expose visitors or household members to risk a bite incident.

Reported bite cases were more in males with 65.3%, than females 34.7%. This is consistent with the results of Adeleke (2010); Aghahowa & Ogbeoveon (2010); Karshima *et al.* (2013); Otolorin *et al.* (2014) and Yibrah & Damtie (2015). This may be attributed to the explorative nature of the males and the activities they are frequently involved in, and living in an urban setting is a risk factor, as people live in crowded conditions, which may favor dog bites. Also, the bites were less in children (19.4%) and high in adults (80.6%). These large proportions of attack cases among adults can be explained that, adults are more enterprising and consequently get exposed to dogs' bite as they transact business from one location to another. This finding agrees with the report of Abubakar & Bakari (2012); Otolorin *et al.* (2015).

The findings of this study have also shown that most of the dog bite cases occurred around the lower limb. This was similar to what was documented by Ojuawo & Abdulkareem (2000) in Ilorin, Abubakar & Bakari (2012) in Kaduna, Iyalohme & Iyalohme (2015) in Auchi, Eke *et al.* (2015) in Enugu and Ezra *et al.* (2017) in Ekiti. The occurrence of dog bites in this study at the lower extremities may be due to the closeness of this part of the body to the animal and victims have used their legs in an attempt to defend themselves. Thus, defensive aggression is a major contributing factor to the dog bites. This may be correlated with territorial protection by dogs.

From clinical records, 52% of the dog bite victims in our study presented themselves within 24 hours of sustaining the bite. This is lower than 82% and 87.7% by Abubakar & Bakari (2012) in Kaduna and Ezra *et al.* (2017) in Ekiti, respectively. The explanation for this finding might be due to the health centre's proximity to dog bite victims, and being a referral (tertiary) health institution where there is the availability of ARV. Also, these victims may be well aware of the danger of rabies and seek medical care on time. Besides these, the potential for early presentation could also be as a result of the nature of wound sustained by the victims. Some victims had local remedies administered before the presentation at the hospital thereby delayed their presentation, thus, putting the victims at risk of developing complications. This report is in conformity with the submissions of Mshelbwala *et al.* (2013), Otolorin *et*

al. (2014) and Nwoha & Ugwoke (2017) where they opined that most dog bite victims in Aba and Umuahia seek local remedies method of treatments, which has no scientific bases, thereby jeopardizing the control of rabies in the State. These types of treatment- seeking behavior may be the outcome of many persisting myths and false beliefs among the victims associated with dog bite management (Reuben *et al.*, 2017).

The vaccination status of the dogs was lamentably low (31.6%) in this study, when mass vaccination of domestic dogs has successfully eliminated dog-mediated rabies in Tanzania, Visayas- the Philippines (WHO, 2016) and the province of KwaZulu-Natal in South Africa (WHO, 2018). This finding is at variance with Nwoha & Ugwoke (2017), where they reported victims of dog bite did not know history of vaccination. Nevertheless, this low coverage is in harmony with the submission of Odita *et al.* (2019) where they said that financial constraints and owners' apathy were contributing factors to low vaccination coverage in Jos South Local Government. Area of Plateau State.

Dog bite management procedures in this study conform to the PEP protocol as recommended by WHO (2018) for both bite and non-bite exposures using human diploid cell vaccine (HDCV) and human rabies immune globulin (HRIG). The recommended post-exposure prophylaxis is intramuscular administration of human diploid cell vaccine into the deltoid on days 0, 3, 7, 14, and 28. The use of human rabies immune globulin was low among vaccine-treated persons in this study, though in conformity with the findings of Abubakar & Bakari (2012) in their studies where less than 1% received HRIG. This could be almost certainly that HRIG is expensive.

From the records, 59 (60.2%) victims successfully completed ARV regimen. This is in agreement with other studies Abubakar & Bakari (2012) and Iyalohme & Iyalohme (2015) though lower than their 60.5% and 90.5% respectively that received post-exposure prophylaxis. None of the victims that received PEP developed rabies. Thus, PEP was justified in all victims it was administered to and demonstrated high irrefutable efficacy in putting off rabies. Also, there was no evidence base in the hospital records regarding follow-up statuses of the offending dogs to know, if these (dogs) involved in the 59 cases that successfully completed their treatment regimen were alive or not.

A total of 71 (72.4%) victims were successfully treated and discharged from the facility. In contrast, 23 patients did not complete their immunization; clinic records did not proffer reason(s) for this loss to

follow-up. Authors think that they may have no resources to complete their immunization as opined by CDC (2014); or it could be that they discontinued their treatment after the expiration of 14 days of the offending dog's quarantine and nothing happened to the dogs.

All cases of rabies-related deaths recorded in this study may be due to late presentation at the hospital following bite by dogs, they never received any PEP. The dog bite victims who died had further demonstrated the 100% case fatality of the disease. One can infer that parents of these dead children may have delayed their presentation either due to ignorance of the risk they were faced with, poverty, distance from this health facility, or they may have presented earlier to local remedy's centre or a primary health-care provider that could not manage the cases appropriately. Post mortem inspection or autopsies was not conducted on any dead victim. Diagnosis was done based on the clinical presentation along with a history of exposure to dog bites. This report is in alliance with the findings of Mshelbwala *et al.* (2013); Otolorin *et al.* (2015) and Ezra *et al.* (2017). Further investigation revealed that the dogs involved in the bites were killed and buried. three of the dogs were owned while one was a stray. The 4 cases of rabies seen over the period under-review may be a gross of under-representation of the enormity of the crisis in this setting. This is because some cases of rabies may have died in the communities. Additionally, similar study has reported 6 cases of human rabies in Enugu (Eke *et al.*, 2015).

In conclusion, dog bite cases in this study occurred more in males and adults with owned dogs being mostly involved in the reported cases. The majority of the victims presented themselves at the Centre within 24 hours of dog bite. Significant numbers of dogs involved in the bites were unvaccinated. Treatment pattern was based on categories of exposure of victims. 71 dog bite victims were successfully discharged and 23 victims lost to follow-up. Additionally, four deaths were recorded following observed clinical signs of rabies. Public awareness is required on the need to avoid provocative dog bites, prompt hospital visitation when bitten by a dog, and there is need for dog owners to vaccinate their dogs annually against rabies.

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Conflicts of Interest

The authors declare no conflict of interest.

References

- Abubakar SA & Bakari AG (2012). Incidence of dog bite injuries and clinical rabies in a tertiary health care institution: a 10-year retrospective study. *Annals African Medicine*, **11**(2): 108-111.
- Adeleke SI (2010). Impact of dog bite in Kano city: a retrospective study. *Nigerian Journal of Clinical Practice*, **13**(1): 67-69.
- Aghahowa SE & Ogbeveon RN (2010). Incidence of dog bite and anti-rabies vaccine utilization in the University of Benin Teaching Hospital, Benin city, Nigeria: A 12-year assessment. *Vaccine*, **28**(30): 4847- 4850.
- Alabi O, Nguku P, Chukwukere S, Gaddo A, Nsugbuga P & Umoh J (2014). Profile of dog bite victims in Jos Plateau State, Nigeria: a review of dog bite records (2006-2008). *Pan African Medical Journal*, doi: 10.11694/pamj.suppl.2014.18.1.4341.
- Ameh VO, Dzikwi AA & Umoh, JU. (2014). Assessment of knowledge, attitude and practice of dog owners to canine rabies in Wukari metropolis, Taraba State Nigeria. *Global Journal of Health Science*, **6** (5): 226-240.
- Centre for disease control and prevention (2014). www.cdc.gov/ncidod/dvrd/rabies, retrieved 12-03-2014.
- Dwyer JP, Douglas TS & Van As AB (2007). Dog bites injuries in children – a review of data from a South African pediatric trauma unit. *South African Medical Journal*, **97**(8): 597- 600.
- Eke CB, Omotowo IB, Ukoha OM & Ibe BC (2015). Human rabies: Still a neglected preventable disease in Nigeria. *Nigerian Journal of Clinical Practice*, **18**(2): 268-272.
- Ezra OO, Oladele SO, Isaac OO, Adekoya JI, Adekwe BT, Oyinkansola TA, Alfred A & Adewale F (2017). Pattern and outcome of dog bite injuries among children in Ado-Ekiti, Southwest Nigeria. *Pan African Medical Journal*, doi:10.11604/pamj.2017.27.81.7360.
- Gilchrist J, Sacks JJ, White D & Kresnow MJ (2008). Dog bites: Still a problem? *Injury Prevention* **14**(5): 296-301. doi:10.1136/ip.2007.016220.

- Hampson K, Coudeville L, Lembo T, Sambo M, Kleffer A, Attlan M, Barrat J, Blanton JD, Briggs DJ, Cleaveland S, Costa P, Freuling CM, Hiby E, Knopf L, Leanes F, Meslin F-X, Metlin A, Miranda ME, Muller T, Nel LH, Recuenco S, Rupprecht CE, Schumacher C, Taylor L, Vigilato MAN, Zinsstag J & Dushoff J. (2015). Estimating the global burden of endemic canine rabies. *Plos Neglected Tropical Diseases*, **9**(4): 1-20.
- Iyalomhe GBS & Iyalomhe SI (2015). Dog bite and clinical rabies in a suburban hospital in Nigeria: a 20-year retrospective study of prevalence and treatment with ant-rabies vaccine. *World Journal of Pharmaceutical Research*, **4**(1): 113-121.
- Kahn A, Bauche P & Lamoureux J (2003). Child victims of dog bite treated in emergency departments: A prospective survey. *European Journal of Pediatrics*, **162**(4): 254-248.
- Karshima NS, Kujul NB, Ogbu KI, Abdullateef MH, Dung PA & Salihu AA (2013). Incidence and risk factors associated with rabies and dog bites among dogs involved in bites in Plateau state, Nigeria between 2011 and 2012. *Journal on Animal Science Advances*, **3**(3): 114-120.
- Kassiri H, Kassiri A, Lotfi M, Shahkarami B & Hosseini SS. (2014). Animal bite incidence in the County of Shush, Iran. *Journal of Acute Disease*, **3**(1):26-30.
- Kreisfeld R & Harrison J (2005). Dog-related injuries. AIHW National Injury Surveillance Unit Research Centre for Injury Studies Flinders University South Australia, <https://webarchive.nla.gov.au/awa/20060314005013/http://pandora.nla.gov.au/pan/56745/20060314-0000/injcat75.pdf>, retrieved 17-11-2020.
- Mshelbwala PP, Maikai VB, Angani MT, Nlebedum UC, Nwokocha QN, Garba A and Ogunkoya AB (2013). Retrospective study of dog bite cases Reported to Zonal Veterinary Clinic, Umuahia, Abia state; Nigeria. *Journal of Experimental Biology and Agricultural Sciences*, **1**(4): 317 – 320.
- Nwoha RIO & Ugwuoke FN (2017). Incidence of Dog bite cases in Human in Umuahia Local Government Area of Abia State. *Journal of Veterinary Medical Surgery*, doi: 10.4172/2574-2868.100012.
- Odita CI, Tekki IS, Moses DG, Barde JJ, Egwu KO, Idachaba SE, Ahmed JS, Ifende VI, Makanju O, Ugbe DA, Zhakom PN, Nzekwe E, Watsamanda N, Okpala G, Dashe Y, Nwosuh C, Okewole PA & Shamaki D (2019). Dog anti-rabies vaccination coverage in Jos South LGA of Plateau State, Nigeria. *Sokoto Journal of Veterinary Sciences*, **17**(3): 30 - 34.
- Ojuawo A & Abdulkareem A (2000). Dog bite in children, Ilorin. *Sahel Medical Journal*, **3**(1): 33 – 36.
- Otolorin GR, Aiyedun JO, Mshelbwala PP, Ameh VO & Dzikwi AA (2015). A review on human deaths associated with rabies in Nigeria. *Journal of Vaccines and Vaccine*, doi: 10.4172/2157-7560.1000262.
- Otolorin GR, Umoh JU & Dzikwi AA (2014). Cases of dog bite in Aba, Abia State Nigeria and its public health significance. *International Journal of Tropical Disease and Health*, **4**(10): 1097-1103.
- Reuben CR, Gya SD & Mwanta,DP (2017). Knowledge, attitude and practice of rabies in and around Lafia Metropolis, Nigeria. *Central African Journal of Public Health*, **3**(3):27 -33.
- Schalamon J, Ainoedhefer H, Singer G, Petnehazy T, Mayr J, Kiss K & Hollworth ME (2006). Analysis of dog bites in children who are younger than 17 years. *Pediatrics*, **117**(3): 374-379.
- WHO (2013). *World Health Organization Rabies fact sheet* NO: 99. July 2013. <http://www.who.int/mediacentre/factsheets/fs099/en>, retrieved 28-02-2014.
- WHO (2016). *Global Elimination of Dog-mediated Human Rabies*. Report of the Rabies Global Conference 10 - 11 December 2015 Geneva, Switzerland. [Who/htm/ntd/nzd/2016.02](http://www.who.int/htm/ntd/nzd/2016.02). Retrieved 03/05/2019.
- WHO (2017). *World Health Organization 10 facts on rabies*, <https://www.who.int/features/factfiles/rabies/en/>, retrieved 16-10-2020.
- WHO (2018). *World Health Organization, Rabies control in KwaZulu-Natal, South*, <https://www.who.int/bulletin/volumes/96/5/17-194886/en/>, retrieved 19-11-2019.
- Yibrah M & Dامتie D (2015). Incidence of human rabies exposure and associated factors at the Gondar Health Centre, Ethiopia: A three-year retrospective study. *Infectious Diseases of Poverty*, **4**(3): 1-6.