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EFFECT OF *SNAKEBITE* ON *OSTEOMYELITIS* AND *CARDIAC SHOCK IN PEDIATRIC* AND ADULT PATIENTS

[1]R. Mohamad Javier, [2]Laksmitha Saktiono Safitri, [3]Andisa Fadhila Rialdi, [4]Ehwanul Handika, [5]Ericko Julian Limanto, [6]Budi Prakoso, [7]Bambang Widiwanto, [8]Himawan Wicaksono, [9]Zainuddin Hamidi, [10]Djanuar Fitriadi, [11]Sukirman

[1247]Universitas Muhammadiyah Malang, [3]Universitas Hasanuddin, [5]Universitas Katolik Widya Mandala Surabaya, [8]RS Mitra Keluarga Cikarang, [1011]Puskesad, [69]RST Dr Soepraoen malang
javierbedah@webmail.umm.ac.id, laksmithas@gmail.com, andisafadhila@gmail.com, andika.negara@gmail.com, erickojulian7@gmail.com, budiprakoso87@gmail.com, bambangwidianto@umm.ac.id, drhimawanw@yahoo.co.id, zainuddinhamidi@yahoo.com, djanuarfitriadi@gmail.com, dr.sukirman@yahoo.co.id

ABSTRACT

Snakebite is a defense mechanism of snakes and can be a medical emergency. Snake venom contains a mixture of protein components that affect the functional activity of the target physiology. The structure of the poison in snake venom has different variations for different snake species. As for *snakebite*, it can be life-threatening if it has neurotoxic, cytotoxic, or hemotoxic toxic effects. The purpose of this study is to determine the relationship between *snakebite* incidence to osteomyelitis and *cardiogenic shock.* The results of this study can be used as a source of information and an objective correlation reference regarding the relationship between snakebite and osteomyelitis and cardiogenic shock. This research is a Systematic Review using the Preferred Reporting Items for Systematic Reviews and Meta-analyses method or commonly called PRISMA, this method is carried out systematically by following the correct research stages or protocols. Antivenom neutralizes toxins in fixed quantities. Both children and adults are given the same amount of antivenom because snakes inject the same amount of poison into both adults and children. Antivenom can be effective as long as the poison is still active in the patient's body causing symptoms of systemic intoxication. It can last for several days or even weeks after the bite. After a series of processes have been passed, based on the results of research in the Scopus-indexed journal on the systematic "The Relationship of Snakebite with Osteomyelitis and Cardiac shock in Pediatric and Adult Patients" a conclusion can be drawn, namely that the majority of journals discuss heart disorders and infections, necrosis of muscles and bones related to poisonous snake bites.

Keywords: *snakebite, medical, cardiogenic shock*

INTRODUCTION

Snakebite is a defense mechanism of snakes and can be a medical emergency. Snake venom contains a mixture of protein components that affect the functional activity of the physiological target. The structure of the poison in snake venom has different variations for different snake species. Snakebite can be life-threatening if it has neurotoxic, cytotoxic, and deep hemotoxic toxic effects (Babangida *et al*., 2020; Slagboom *et al*., 2017).

In 2009, WHO included snakebites in its list of neglected tropical diseases, and became a global problem. It is estimated that there are 3,500,000 cases of snakebite, 1,100,000 cases of poison, and about 60,000 deaths from snakebite each year. Snakebite is a significant cause of morbidity and mortality worldwide, especially in South and Southeast Asia, sub-Saharan Africa, and Latin America (Adiwinata et al., 2015).

In Indonesia, there are estimated to be around 120,000 snakebite cases with an estimated mortality rate of 20 to 11,581 in 2007. The estimate is based on many influencing factors, such

as the large number of snakebite cases that occur in rural areas, improper traditional medicine, and treatment does not reach the hospital. (Adiwinata et al., 2015; Gutierrez et al., 2017).

The process of spreading snakebite poison begins after the snake bite appears the condition of local swelling. Swelling is usually detected within 2-4 hours and can expand rapidly until it reaches its peak on the second or third day. Blistering/blistering appears within 2-12 hours, and visible tissue necrosis appears within 1 day after the bite. Peeling of necrotic tissue and secondary infections, including osteomyelitis, become complications of snakebite if not given proper treatment (Resiere et al., 2020).

The impact of complications from snakebite includes osteomyelitis and cardiogenic shock. Osteomyelitis is a bacterial infection of the bones, which most often occurs in children. It is known that 85% of patients with osteomyelitis are under 17 years old. Chronic osteomyelitis is a major health problem due to its significantly high morbidity (Martin et al., 2016).

In addition to osteomyelitis, another complication in cases of snakebite is cardiogenic shock. According to research in hospitals in America at the Mayo Clinic Hospital in 2016-2018, in 1029 the highest shock cases were single shock cardiac shock cases at 65% followed by mixed shock at 14%, shock sepsis at 12%, and the rest at other shocks.

Some studies report that snakebite is associated with adverse complications such as nephrotoxicity, kidney failure, cardiotoxicity, tissue necrosis, osteomyelitis, aspiration pneumonia, and endowed shock that can result in death. Understanding of the relationship between snakebite to osteomyelitis and cardiogenic shock is rarely known and discussed in the review literature, which is why researchers are researching the correlation of these variables.

The purpose of this study was to determine the relationship between snakebite incidence to osteomyelitis and cardiogenic shock. The benefit of this study is that the results of this study can be used as a source of information and an objective correlation reference regarding the relationship between snakebite and osteomyelitis and cardiogenic shock.

METHOD

This research is a Systematic *Review* using the *Preferred Reporting Items for Systematic Reviews and Meta-analyses* method or commonly called PRISMA, this method is carried out systematically by following the correct research stages or protocols. *Systematic review* is one of the methods that uses reviews, *reviews*, structured evaluations, classifications, and categorizations of *evidence-based* that have been produced previously. The steps in the implementation of *systematic review* are very planned and structured so that this method is very different from the method that is just to deliver a literature study. *The procedure* of *this systematic review* consists of several steps, namely 1) compiling the Background and Purpose, 2) *Research Question*, 3) *Searching for the literature* 4) *Selection Criteria* 5) *Practical Screen* 6) *Quality Checklist and Procedures* 6) D*ata Extraction Strategy*, 7) *Data Synthesis Strategy.*

RESULTS AND DISCUSSION

Snakebite in Pediatric and Adult Patients

Basically, the pathophysiology, symptoms, and diagnosis of snakebites in pediatric and adult patients are the same. However, there are slight differences in management in treating snakebites in pediatric and adult patients.

Antivenom neutralizes toxins in fixed quantities. Both children and adults are given the same amount of antivenom because snakes inject the same amount of poison into both adults and children. Antivenom can be effective as long as the poison is still active in the patient's body causing symptoms of systemic intoxication. It can last for several days or even weeks after the bite (Babangida et al., 2020; Gutierrez et al., 2017).

The differentiator of antinyeri administration in adults and children is given a differentiator. In adult doses, paracetamol size 1-4 grams is given within 24 hours, while in children it is 15-20 mg/kg with a maximum provision in children of 100 mg/kg/day (Babangida et al., 2020).

Snakebite Relationship with Osteomyelitis

In developing countries, snake bites can cause necrosis and osteomyelitis, with consequent deformities, especially in children (J. C. Menon & Joseph, 2015). Ganggren, osteomyelitis, and hypopituitarism are the only long-term complications associated with snake bites in victims (Gaido et al., 2017).

After being bitten, a local swelling condition is usually detected within 2-4 hours and can expand quickly until it reaches its peak on the second or third day. Blistering appears in 2-12 hours, and tissue necrosis becomes apparent within 1 day after the bite. Exfoliation of necrotic tissue and secondary infections (Rajan, 2017). A long-term consequence of snakebite wounds that are not treated properly is osteomyelitis in wounds that do not heal (Resiere et al., 2020).

Snakebite's Relationship with Cardiac Shock

According to Babangida (2020), hypotension and secondary hypovolemia result from the extravasation of plasma volume in bitten limbs, causing external or invisible blood loss, emetic symptoms due to sympathetic nerve disorders or fears such as persistent vomiting, and failure of adequate oral fluid intake.

Direct cardiovascular effects of toxins such as inhibition of physiological vasomotor systems such as the angiotensin-renin-bradykinin system due to snake venom and sometimes cause anaphylactic effects triggered by antivenom. The effects of Snakebite also affect ions and electrolytes such as potassium which affect the rhythm and contraction of the heart. A few hours after the bite can cause cardiogenic shock and cardiac arrest due to hyperkalemia in patients with massive general skeletal muscle damage (rhabdomyolysis) and cytotoxic effects that are well handled (Babangida et al., 2020).

Viperid snake venom induces more pronounced local signs such as (edema, blistering, necrosis), cardiovascular shock, and acute renal failure. Neurological engagements such as increased salivation, ptosis, respiration, and general paralysis are seen more in the bites of Elapidae (Aryal et al., 2017).

Research limitations & Medical Implications

In this study, there are limitations of research experienced by researchers. Researchers identified limitations including:

There are some journals that cannot be accessed in full / Full Text so authors need a long time to find journals.

Authors need time to collect journals related to the problem to be used as reference sources that match the problem.

Authors need more timeto analyze and understand the content of the journal and collect journals or books related to the problem to be used as appropriate reference sources.

Limited number of journals related to research variables on the relationship of snakebite to osteomyelitis in pediatric and adult patients

At least researchers found a journal that listed detailed results on the snakebite association with cardiac shock in pediatric and adult patients

The results of the study showed that snakebite is associated with the incidence of osteomyelitis and cardiac shock in pediatric and adult patients. Based on the results of this study, it is hoped that medical personnel will gain insight into the relationship between snakebite related to the incidence of osteomyelitis and cardiac shock in pediatric and adult patients.

CONCLUSION

After a series of processes have been passed, based on the results of research in the Scopus-indexed journal on systematic "The Relationship of Snakebite with Osteomyelitis and Cardiac shock in Pediatric and Adult Patients" a conclusion can be drawn, namely that the majority of journals discuss heart disorders and infections, necrosis of the muscles and bones associated with poisonous snake bites. And there are similarities in symptoms and management of poisonous snake bites in children and adults.

In developing countries, snake bites can cause necrosis and osteomyelitis, with consequent deformities, especially in children (Gaido et al., 2017). After being bitten, a local swelling condition is usually detected within 2-4 hours and can expand quickly until it reaches its peak on the second or third day. Blistering appears in 2-12 hours, and tissue necrosis becomes apparent within 1 day after the bite. Exfoliation of necrotic tissue and secondary infections (Rajan, 2017). A long-term consequence of snakebite wounds that are not treated properly is osteomyelitis in wounds that do not heal (Resiere et al., 2020).

Direct cardiovascular effects of toxins such as inhibition of physiological vasomotor systems such as the angiotensin-renin-bradykinin system due to snake venom and sometimes cause anaphylactic effects triggered by antivenom. The effects of Snakebite also affect ions and electrolytes such as potassium which affect the rhythm and contraction of the heart. A few hours after the bite can cause cardiogenic shock and cardiac arrest due to hyperkalemia in patients with massive general skeletal muscle damage (rhabdomyolysis) and cytotoxic effects that are well handled (Babangida et al., 2020).

The results of treatment in cases of osteomyelitis with cardiogenic shock due to snakebite complications rely on extensive surgical debridement and adequate and effective antibiotic therapy. Empirical antibiotics can be given after collecting culture samples in non-septic patients. The duration of antibiotic therapy varies from four weeks to six months, and treatment should be adjusted based on the results of the cultures collected. Acute cases of infection can be treated with antibiotic therapy that lasts for four to six weeks. Chronic infections should be treated with extensive surgical debridement and removal of synthesis material, this can collaborate with bone surgery procedures (replacement) if according to (Jayawardana et al., 2016; Five et al., 2014) the indications of ortophedy. Due to the formation

of biofilms, the total time of administration of antibiotics in this infection is three to six months. Surgical treatment is mandatory when an abscess is found. Surgical drainage associated with debridement is performed after confirmation of the diagnosis with a bone biopsy in the operating room, with all the resources of asepsis and antisepsis. The surgical approach can be open surgery, arthroscopy or puncture/aspiration and flushing. Adequate debridement is the best predictor of success in the treatment of osteomyelitis (Five et al., 2014).

REFERENCES

Adiwinata, R., Nelwan, E. J., & Juwita Nelwan, E. (2015). *CLINICAL PRACTICE 358 Acta Medica Indonesiana-The Indonesian Journal of Internal Medicine Snakebite in Indonesia* (Issue October).

Aktar, F., Aktar, S., Yolbas, I., et al. (2016). Evaluation of risk factors and follow-up criteria for severity of snakebite in children. *Iranian Journal of Pediatrics*, *26*(4). https://doi.org/10.5812/ijp.5212

Alirol, E., Lechevalier, P., Zamatto, F., et al. (2015). *Antivenoms for Snakebite Envenoming : What Is in the Research Pipeline ? September 2014*, 1–11. https://doi.org/10.1371/journal.pntd.0003896

Aryal, N., Thapa, M., Singh, U., et al. (2017). A descriptive epidemiological study of snake bite cases among children in Eastern Nepal. *Medical Journal of Shree Birendra Hospital*, *16*(2), 10–17. https://doi.org/10.3126/mjsbh.v16i2.18471

Babangida, S., Erhabor, O., Erhabor, T., et al. (2020). *SJMLS-5 (4)-006 A review on Snake Bite and Management in Nigeria-The Need for The Development of a Snake Bite Strategy 1 1 2 3*.

Brenes-Chacón, H., Gutiérrez, J. M., Camacho-Badilla, K., et al. (2019). Snakebite envenoming in children: A neglected tropical disease in a Costa Rican pediatric tertiary care center. In *Acta Tropica* (Vol. 200). Elsevier B.V. https://doi.org/10.1016/j.actatropica.2019.105176

Chippaux, J. P. (2017). Incidence and mortality due to snakebite in the Americas. *PLoS Neglected Tropical Diseases*, *11*(6). https://doi.org/10.1371/journal.pntd.0005662

Feola, A., Marella, G. L., Carfora, et al. (2020). Snakebite envenoming a challenging diagnosis for the forensic pathologist: A systematic review. In *Toxins* (Vol. 12, Issue 11). MDPI AG. https://doi.org/10.3390/toxins12110699

Gaido, G., D'Aquila, D., Maltesi, L., et al. (2017). TREATMENT OF TIBIAL PSEUDARTHROSIS SECONDARY TO SNAKE BITE IN PEDIATRIC AGE: CHAARIA MISSION HOSPITAL COLLABORATIVE EXPERIENCE. *East African Medical Journal*, *94*(7), 589–591. https://doi.org/10.1371/journal.pmed.0050218

Gutierrez, J. M., Calvete, J. J., Habib, A. G., et al. (2017). *Snakebite envenoming*. https://doi.org/10.1038/nrdp.2017.63

Habib, A. G., Kuznik, A., Hamza, M., et al. (2015). Snakebite is Under Appreciated: Appraisal of Burden from West Africa. *PLoS Neglected Tropical Diseases*, 9(9). https://doi.org/10.1371/journal.pntd.0004088

Jayawardana, S., Gnanathasan, A., Arambepola, C., et al. (2016). *Chronic Musculoskeletal Disabilities following Snake Envenoming in Sri Lanka : A Population-Based Study*. 1–15. https://doi.org/10.1371/journal.pntd.0005103

Jentzer, J. C., Ahmed, A. M., & Vallabhajosyula, S. (2018). Shock in the cardiac intensive care unit : Changes in epidemiology and prognosis over time. *American Heart Journal*, *232*. https://doi.org/10.1016/j.ahj.2020.10.054

Karunanayake, R. K., Dissanayake, D. M. R., et al. (2014). A study of snake bite among children presenting to a paediatric ward in the main Teaching Hospital of North Central Province of Sri Lanka. *BMC Research Notes*, *7*(1). https://doi.org/10.1186/1756-0500-7-482

Kim, O. H., Lee, J. W., Kim, H. il, et al. (2016). Adverse cardiovascular events after a venomous snakebite in Korea. *Yonsei Medical Journal*, 57(2), 512–517. https://doi.org/10.3349/ymj.2016.57.2.512

Kshirsagar, V. Y., Ahmed, M., & Colaco, S. M. (2013). Clinical Profile of Snake Bite in Children in Rural India. In *Iranian Journal of Pediatrics* (Vol. 23, Issue 6). http://ijp.tums.ac.ir

Kumar, K. J., Srujan, Chowdary, A., et al. (2017). Myocarditis complicating viper snake bite in a child. *Toxicology International*, *24*(2), 211–215. https://doi.org/10.22506/ti/2017/v24/i2/162427

Lima, A. L. L., Oliveira, P. R., Carvalho, V. C., et al. (2014). Recommendations for the treatment of osteomyelitis. In *Brazilian Journal of Infectious Diseases* (Vol. 18, Issue 5, pp. 526–534). Elsevier Editora Ltda. https://doi.org/10.1016/j.bjid.2013.12.005

Liwang, F., Nuraeni, F., & Karyanti, M. R. (2021). Snake bite management in a toddler: A case report in Sumbawa Besar. *Paediatrica Indonesiana(Paediatrica Indonesiana)*, *61*(4), 171–174. https://doi.org/10.14238/pi61.4.2021.171-4

Mahakalkar, S., Choudhury, A., Vathulya, M., et al. (2021). Limb salvage following snakebite using acute limb shortening and secondary lengthening. *International Journal of Critical Illness and Injury Science*, 11(2), 98–101. https://doi.org/10.4103/IJCIIS.IJCIIS_43_20

Martin, A. C., Anderson, D., Lucey, J., et al. (2016). Predictors of outcome in pediatric osteomyelitis: Five years experience in a single tertiary center. *Pediatric Infectious Disease Journal*, *35*(4), 387–391. https://doi.org/10.1097/INF.0000000000001031

Mehta, S. R., & Sashindran, V. K. (2017). Clinical features and management of snake bite. *Medical Journal Armed Forces India*, *58*(3), 247–249. https://doi.org/10.1016/S0377-1237(02)80140-X

Menon, J. C., & Joseph, J. K. (2015). Complications of hemotoxic snakebite in India. In Toxinology *: Clinical Toxinology in Asia Pacific and Africa* (pp. 209–232). Springer Netherlands. https://doi.org/10.1007/978-94-007-6386-9_22

Menon, J., Menon, J. C., Joseph, J. K., et al. (2016). Clinical Profile and Laboratory Parameters in 1051 Victims of Snakebite from a Single Centre in Kerala, South India Article in The Journal of the Association of Physicians of India ·. In *Journal of The Association of Physicians of India* ■ (Vol. 64). https://www.researchgate.net/publication/304825879

Modler, H., & Marks, C. J. (2012). Snake bite in southern Africa: diagnosis and management. In *Continuing Medical Education* (Vol. 30, Issue 10).

Murase, K., & Takagi, K. (2012). Takotsubo cardiomyopathy in a snake bite victim: a case report. In *Pan Africa Medical Journal-ISSN* (Vol. 13).

Niraj, M., Jayaweera, J. L., Kumara, I. W. G. D. , et al. (2013). Acute myocardial infarction following a Russell's viper bite: A case report. *International Archives of Medicine*, *6*(1). https://doi.org/10.1186/1755-7682-6-7

Paudel, K. M., & Sharma, S. (2012). Study of clinico-epidemiological profile and outcome of poisonous snake bites in children. *Journal of Nepal Paediatric Society*, *32*(1), 47–52. https://doi.org/10.3126/jnps.v32i1.5948

Priyankara, W. D. D., Manoj, E. M., Gunapala, A., et al. (2019). Cardiogenic Shock due to Kounis Syndrome following Cobra Bite. *Case Reports in Critical Care*, *2019*. https://doi.org/10.1155/2019/5185716

Rajan, D. S. (2017). Surgical Management of Snake Envenomation in India Current Perspective. Public Health *Review: International Journal of Public Health Research*, *4*(1), 13–19. https://doi.org/10.17511/ijphr.2017.i1.03

Resiere, D., Monteiro, W., Houcke, S., Pujo, J. M, et al. (2020). Bothrops Snakebite Envenomings in the Amazon Region. In *Current Tropical Medicine Reports* (Vol. 7, Issue 2, pp. 48–60). Springer. https://doi.org/10.1007/s40475-020-00203-4

Sankar, J., Nabeel, R., Sankar, M. J., et al. (2013). Factors affecting outcome in children with snake envenomation: A prospective observational study. *Archives of Disease in Childhood*, *98*(8), 596–601. https://doi.org/10.1136/archdischild-2012-303025

Slagboom, J., Kool, J., Harrison, R. A., et al. (2017). *Haemotoxic snake venoms : their functional activity , impact on snakebite victims and pharmaceutical promise*. *February*, 947–959. https://doi.org/10.1111/bjh.14591

Smith, H., & Brown, D. (2019). Multiple thromboembolic strokes in a toddler associated with Australian Eastern Brown snake envenomation. *Radiology Case Reports*, *14*(8), 1052–1055. https://doi.org/10.1016/j.radcr.2019.05.034

Tekin, R., Sula, B., Cakirca, G., et al. (2015). Comparison of snakebite cases in children and adults. *European Review for Medical and Pharmacological Sciences*, *19*, 2711–2716.

van Schuppen, J., van Doorn, M. M. A. C., & van Rijn, R. R. (2012). Childhood osteomyelitis: Imaging characteristics. In *Insights into Imaging* (Vol. 3, Issue 5, pp. 519–533). Springer Verlag. https://doi.org/10.1007/s13244-012-0186-8

Yuniasih, D. (2021). Snakebite as a neglected disease in indonesia. *Indonesian Journal of Medicine and Health*, *13*(1), 1–3. https://doi.org/10.20885/JKKI.Vol13.Iss1.art1