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Research Article

Epidemiology of Listerosis in Animal and Human in Ethiopia

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Abstract

Listeriosis is an important food borne bacterial disease for both human and animals. The objective of the paper was to review the Epidemiology of *listeria* in animal and human in Ethiopia. From the studies conducted in different area of the country 7 species of *Listeria* were reported namely: *L. monocytogenes, L. innocua, L. welshimeri, L. seeligeri, and L. ivanovii,* and *L. grayi, L. welshimeri*. Among those species L. monocytogenes is the most species that is zonootic for both humans and animals. Occasionally *L. seeligeri, L. ivanovii* are affected animals and humans. The overall prevalence of the listeriosis was reported in the country: 3.8%, 14%, 20%, 20.8%, 24.2%, 25, 26.1, 26.6%, 27.5%, 28.4%, 32.6%, 32.9% and 42.9% respectively. The most common source of infection: human feces, animal feces, aborted fetus, soil, both farm and surface water troughs, animals feed and the walls. The main Reservoir, risk factors for distribution of the disease are forage, water, mud, silage and host, management, pathogenic risk factors respectively. Pregnant women and their fetuses, newborn babies, the elderly and immunocompromised individuals are the people at risk for the disease. The major clinical forms of *listeria* in cattle are encephalitis, abortion, endocarditics, conjunctivitis, metrits and meningitis. The ways to control of disease in foods relies largely on Hazard analysis critical point approach and the establishment of effective critical control points in food industry. The preparation of silage should be made for good quality, with early cutting of grass, reduce contamination with soil and ensuring optimal anaerobic fermentation, which will insure that the pH falls below 5 levels for inhibited growth of *Listeria* species. They must be improving hygienic management for animals and health educations for peoples about the disease for reduce infection.

Introduction

Listeriosis is the most important emerging food borne of bacterial zoonotic infections in worldwide that arises mainly from the consumption of contaminated food [1]. It is recognized in 1920 for the first time as an infectious disease of rodents and pigs [2]. In developing countries there have been few information on listeriosis, because there is no given attentions and laboratory facilities awareness on the occurrence of listeria species in food [3].

In Ethiopia the disease was occurs, due to ingestion of unpreserved silage and contamination of feed in animal [4]. In veterinary the bacteria can be transmitted though ingestion of

Contamination feed and discharges from the infected cow, the disease can infect both animal and human [5]. Contaminated of vegetables and ready-to-eat meat have been implicated in over as disease for public healthy [6,7]. The Epidemiology of disease was varies as country authors are reported their Studies in different area from the investigation of the disease with different prevalence i.e. the highest prevalence were reported 42.9% from contamination of vegetables [8] and the Lowest prevalence were reported 3.8% from meat and meat product [9].

The older, adults, pregnant women, newborns with immunocompromised systems are highly susceptible of the diseases in both animals and humans. The source of infection of the disease are contaminated milk, cheese, meat are consumed and caused *L. monocytogenes* in human. Contamination of animals feed like silage and human food from animal products considered as a risk factor of listeriosis outbreaks in Ethiopia [10]. The symptoms observed in the affected animals and human included meningitis, still birth, fever, watery diarrhea, nausea, headache, and pain in joints and muscles. Occasionally symptoms like fever, bloody diarrhea and bacteremia are observed [11].

The responsibilities towards to diagnosis of the disease could be by using Conventional cultural method such isolation of agents, Fluorescent Antibody Techniques (FA), inoculation, serological technique, and Polymerase Chain Reaction (PCR) are used to identify Listeria species in laboratory [12]. The optimal treatment of the disease is antibiotics combination such as Trimethoprim and Tetracycline [13]. The best control

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measured of the disease was using Hazard Control Critical Points (HACCP) principles and the establishment of effective critical control points in the process [14].

The economic importance of disease due to production loss abortion, treatment cost, reduces welfare and trade of animal and their by product [15]. The Public healthy importance of the disease pathogen due to contaminated foods of animal origin and disease associated with the expanding immune suppressed, elder, pregnant human population [16].

Therefore the objective of the paper was:

- ✓ To Review the Epidemiology of *Listeria* in animals and humans in Ethiopia

Literature review

Overview of listeria: *Listeria* is found widely in nature. It is primarily food borne bacterial disease in domestic animals and humans. Species of *Listeria* have been isolated from at least 37 species of mammals and 17 species of birds, and from others like flies, ticks, fish, and crustaceans. Several subtypes can be distinguished by laboratory tests. The bacteria were available more common in temperate zones than in tropics. Outbreaks of food-borne listeriosis have been reported from Canada, Switzerland and USA with high fatality rates [17]. In Ethiopia the disease has been reported 2004 in meat, cheese, fish, and pork poultry [10]. The bacterium is often isolated in cattle, sheep, and fowl, and is also found in dairy products, fruits, and vegetables [18].

Etiological and morphological characteristics

Listeria is pleomorphic gram positive, facultative anaerobic, motile, no spore-forming, the intracellular rod shaped bacterium. The taxonomic characteristic order of bacillales, family, listeriaceae, size 0.4-0.5micrometer up to 0.5-2 micro meter, nucleic acid , grows as saprobe in soil, silage, animal manure, sewage, litter, bird dropping, *Listeria* species are psychrophilic the growth at cold temperature (0^{o}C). Contain 13 sero-groups of which 1 and 4 are most common. *L. monocytogenes* is main cause of disease in animals and humans; also *L. ivanovii* and *L. seeligeri* occasionally cause disease in humans [18].

Clinical Sign

In animals: the common symptoms observed Meningoencephalitic form Involves neurological signs, dullness, drooling, lack of interest in food, lateral deviation of the head with a tendency to circle, marked salivation, paralysis then recumbence. Visceral form including: Abortion with retained placenta, still birth, micro abscesses occur throughout the brain, and heart [19].

Human symptoms two observed as febrile gastroenteritis form and invasive systemic disease form. In case of febrile gastroenteritis from the Incubation period of the disease type ranges from 9-48 h after ingestion of contaminated item. The individuals developed, Watery diarrhea, fever, chills, nausea, and vomiting are the main presenting feature. The Invasive systemic disease form of disease is associated with immunologically challenged populations. The groups include pregnant women, unborn fetuses, infants, and elderly people with reduced immunity due to diseases and People taking special medications, such as steroids and chemotherapeutic agents to treat cancer. It crosses blood brain barrier causing inflammation of meningitis and brain stem. In pregnant women, it can pass through the placental barrier infecting the fetus. Abortion and stillbirth follows. Fever, myalgias, CNS signs are the main presenting feature [20].

Diagnosis and treatment

Diagnostic approach of *Listeria* depends on clinical sign, epidemiological information and history. In all cases sample should be collected from the patient and laboratory testing should be requested. Specimens for cases of abortion should include cotyledons, fetal abomasal contents and uterine discharges. Suitable samples from septicemic cases include liver, spleen and blood [7]. For isolation and identification of species be inoculated directly onto blood agar, selective blood agar containing 0.05% potassium tellurite. The plates are incubated aerobically at 37°C for 24 to 48 hours. Commercially indicator media are available such *Listeria* Oxoford which is selective agar and these are designed mainly for the isolation of *Listeria* from human food stuffs [21]. The other most important methods for identification test of *listeria* species in laboratory is Molecular Methods [22].

The optimal antibiotic treatment fot listeriosis was penicillin, ampicillin, erythromycin rifampicin, chloramphenicol, tetracycline and aminoglycosides, with the exception of cephalosporin are effective against *L. monocytogenes*. A combination of trimethoprim and tetracycline was more effectives [23].

Controls and prevention

The best controls strategies of *listeria* in human should be creating awareness among the consumers, farmers and those raising farm animals and using their products. The improvement of farming conditions and relies on HACCP principles [24].

In animals provision of good quality silage and reduce of stressful conditions like dense stocking rates and minimizing ingestion of soil-contaminated pastures [25]. In epidemic area early detection of a listeriosis outbreak and efficient intervention are important in preventing methods. Typing of food isolates and comparison with clinical isolates may also lead authorities to contaminated food processing plants [26]. A pasteurization technique eliminates *Listeria* species from most dairy associated outbreaks. Providers should be maintaining enough suspicion for *Listeria* infection to draw blood cultures for any woman at risk [27].

Epidemiology of listeriosis in Ethiopia

Occurrences: In Ethiopia like other Africa countries most of few reports on listeriosis due to no well-organized epidemiological surveillance systems and few studies in limited

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areas absence awareness of its occurrence of the disease at national level [28]. However nowadays there are some reports on different samples from different part of the country are summarized in the Table 1.

Source of infection and mode of transmission

The major source of infection was animal feces, human feces, farm surry, sewerage sludge, farm water troughs, surface water, and plants animal feed and the walls. The zoonotic one *L. monocytogenes* formulated feeds but, its multiplication is restricted [29].

The organisms available in the feed of animal, silage but not multiply to any significant extent in effectively preserved silage which is characterized by anaerobic storage, high density, a high concentration of organic acids and a pH below 4.5. It may be present in silage which is poorly fermented when silage contains soil its risk to contaminate by *Listeria*. Infected animals can also serve as a source of infection from their urine, feces, aborted fetuses, uterine discharges and the milk [7].

The most common route of infection inadequately pasteurized milk, soft cheeses, and ice Cream and other dairy products also are important sources pregnant women can transmit the infection to their unborn fetuses. Calves may acquire infection from contamination of cow teat, ingestion of milk containing the organism from carrier's animals. The encephalitic form of the disease results from infection of the terminals of the trigeminal nerve consequent to abrasion of the buccal mucosa from feed. Myelitis is result from growth up to spinal nerves subsequent to body area infections [30].

Reservoirs

Listeria species are widely dispersed in the natural environment, including soil, water and decaying vegetation. Common animal reservoirs include domestic and wild mammals such as cattle, sheep and fowls. Humans may also act as reservoirs, particularly abattoir workers and laboratory workers exposed to *L. monocytogenes* culture [31].

Risk factors

Host risk factors: The organisms was Regarding sensitivity, virtually in both wild and domestic animals are susceptible to infection. In cattle it develops sporadically, having a stationary character, without tendency to disseminate in the outbreak. Morbidity and mortality varies according to clinical form [31].

Management risk factor: The most common risk factors for *Listeria* species is that reduce host immune response includes poor nutritional status, transport, overcrowding and insanitary conditions with poor access to feed supplies [32].

Pathogenic risk factor: The other risk factors of the organism are pathogenic of infection increases due to a massive multiplication of *Listeria* species in the feed or environment. The most important aspect in food hygiene is the ability of the bacteria to survive in a wide range of temperatures and to make biofilms on solid surfaces, including food processing facilities, which are more resistant to disinfectants and sanitizing agents [13]

Population at risk

Ages: The major age at risk are newborn babies and the elderly with age starting greater than 65 Year. Their Immune systems of those elders are very immature and also older age immune systems very weak for response to infection and extremely susceptible to these types of infections [33].

Pregnant animals and human

Maternally listeriosis increases during pregnancy, particularly in the third trimester. Most infected pregnant ruminates and women have mild illness unless they have another underlying illness. In Pregnant women naturally have a depressed cell-mediated immune system [24].

However, about 20% of cases result in spontaneous abortion or neonatal death, and surviving infants develop sepsis or meningitis [33].

Table 1: Prevalence study conducted on Listeria in animals and humans in Ethiopia.

Study area	Sample type	No of sample	Prevalence (%)	Authors
Haramaya University Dairy farm	Silage and water, Cow barn, Milk cow, Milking operation, Milk auditing, Milk supply	200	20%	[28]
Debre-Birhan Town	Bovine raw milk	407	20.88%	[37]
Bishoftu and Dukem	Food of animal origin	340	32.9%	[38]
Arsi and West shew	Food of animal origin	247	42.9%	[8]
Central highlands of Ethiopia.	Raw milk and milk Products	443	28.4	[39]
Gondar Town	Foods of animal Origin	384	25	[5]
North Shewa	Raw milk and dairy Products	384	24.2	[40]
Addis Ababa	Sheep meat from abattoir and butcher shops	384	3.8	[9]
Jimma Town	Retail meat and dairy product	390	14	[41]
Addis Ababa	Food of animal origin	240	27.5	[42]
Addis Ababa	Foods of animal origin and raw meat products	384	26.6%	[43]
Addis Ababa	Food of animal origin	391	26.1%	[44]
Addis Ababa,	Retail meat and milk products	384	32.6%	[10]

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Immunocompromised individuals

Individuals having weakened cell-mediated immunity are more susceptible for infection of the disease. During medical conditions and medications that decrease T-cell mediated immunity increase the risk of listeriosis. Transplants and blood-related cancers confer the greatest risk. HIV seems to rarely lead to listeriosis since the advent of Highly Active Anti-Retroviral Therapy and Trimethoprim-Sulfamethoxazole. Disease like: cancers, liver disease and diabetes all confer a moderate risk of infection [34].

Public healthy importance

Listerosis is not only an intracellular pathogenic bacterium for animals that but it has become an important cause of human food borne infections worldwide. Among *listeria* species *L. monocytogenes* is an infective to all human population group it has a propensity to cause especially severe problems in pregnant women, neonates, the elderly and immunosuppressed individuals [35].

Direct transmission from animals to human is possible especially among veterinarians performing gynecological interventions with aborted animals. Animals may be diseased or asymptomatic carriers of *L. Monocytogenes* shedding the organism in their feces. In Ethiopia the most problem of the disease due to indirect transmission occur simply by consumption of food products from diseased animals [8] reported that on-farm manufactured raw milk cheese made from cattle. Raw or contaminated milk, vegetables and ready-to-eat meat have been implicated in overseas outbreaks [5].

Contamination could be during preparation and it then multiplies during the storage process. Unlike some other food borne pathogens, *Listeria monocytogenes* can multiply in contaminated refrigerated food For example, soft cheese is considered as a high risk product for listeriosis because the bacteria may grow to significant numbers during refrigeration [10].

Conclusions and recommendations

Listeria has gained recognition global as human and animal pathogen. It can grow in a wide range of temperature. In Ethiopia *listeria* were reported from Retail meat and milk products, from Silage and water, Cow barn, Milk cow, Milking operation, Milk auditing, Milk supply, and raw meat products, from raw bovine milk. So far the prevalence of the disease ranges from 3.8% from sheep meat from abattoir and butcher shops and 42.9% from milk and milk products in the country. Maintaining hygiene for preservation of silage and processing machines are the keys in preventing for epidemiology of *Listeria* species. It should be properly reheated before consumption by immune compromised, pregnant animals and human in order to eliminate possible contamination.

Based above information the following recommendations are forwarded

- A food safety management system based on the principles of HACCP with regular reviews should be developed and implemented in dairy and food processing industries.
- There should be treated meat and milk products with heat before consumption which can kill *Listeria* species
- There should be carried out health education for community about the disease.

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