The Effects of Tunga Penetrans Infestation on Academic Achievement in Public Primary Schools: Kenyan Perspective

Rosemary Kawira Mucheke[*1] *(MEd) & Paul M Maithya*[1] *(PhD)*
[1]*Maasai Mara University, P.O Box 861 – 20500 Narok.*
[*]*rosemarymucheke@ymail.com (Corresponding email) mpmaithya2006@gmail.com*

Abstract
The objectives of primary education in Kenya are to acquire literacy, numeracy, creativity and communication skills, enjoy learning and develop desire to continue learning. Also develop ability for critical thinking and logical judgment as well as appreciate and respect the dignity of work. Again, they develop desirable social standards, moral and religious values; a self-disciplined, physically fit and healthy person with aesthetic values, who appreciates own and other peoples' culture. The objectives also emphasize ;awareness and appreciation of the environment, other nations and international community, instil respect and love for own country and the need for harmonious co-existence, develop individual talents, promote social responsibility and make proper use of leisure time besides developing awareness and appreciation of the role of technology in national development. However, questions arise as to whether public primary schools are effectively realizing the above mentioned objectives through achievements in the KCPE examinations. The education system in Kenya is largely examination oriented and the quality of education tends to be evaluated in terms of the number of students passing national examinations. Nevertheless, reports of various taskforces and education commission indicate that efforts have been made to propose various suggestions and recommendations for improving the quality of education. Notably, Kenya has 2.6 million people infected with tunga penetrans and of the total infections, 1.6 million are school children. Hence to address the gaps that affect achievements in public primary schools, which is a pointer to quality education, this article delves into the knowledge about Tunga penetrans, risk factors, symptoms and overall effects on school enrolment, retention, participation, achievement and transition to the next level.The way forward on jigger elimination is suggested.

Key words: *Tunga penetrans, Access, Retention, Completion, Transition, Infestation, Achievement, Curriculum.*

1. Introduction

The Universal Declaration of the Human Rights adopted in 1948, declared "everyone has a right to education." (Bonyo,2012). Consequently, the World Conference on Education For All (EFA), held in Jomtien, Thailand in 1990, sparked off a new impetus in basic education especially its vision and renewed commitment. It was noted that to "serve the basic needs for all, requires more than a recommitment to basic education as now exists. What is needed is an expanded vision that surpasses resource levels, institutional structures, curricula and conventional delivery systems, while building on the best in the practices" (World declaration on Education for All, 1990). This was further amplified by the Dakar conference of 2000 that reviewed developments in achieving Universal Primary Education (UPE) in the African continent and set among its main aims access to and completion of free quality and compulsory UPE by 2015, and improving all aspects of quality of education, that is, measurable learning outcomes in numeric, literacy and essential life skills.

Reports of various taskforces and education commission indicate that efforts have been made to propose various suggestions and recommendations for improving the quality of education (Ominde Report, 1964, and Kamunge Report,1988 as quoted in Koech Report, 1999). Eventually, pupils' achievement has

been recognized as a key pointer to quality of education (Kenya National Examination Council, 2011). Importantly, the Constitution of Kenya has declared every child to have a right to free and compulsory basic education (The Constitution of Kenya, 2010).

Factors that compromise access, retention, completion and achievement in education have always been the concern of the government and other education stakeholders. This informs why the NARC government embraced Free Primary Education in 2003 (Abiero, 2009). Furthermore, in vision 2030, the government's focus is to eliminate poverty and empower Kenyans to enjoy quality and decent livelihoods. Education is identified as one of the key component in the social pillar of the Government's strategy of vision 2030 (G.O.K 2007).

However, the realization of vision 2030 through education is in Jeopardy as Jigger menace has led to school dropout and it is estimated that over 2 million people in Kenya need assistance in relation to Jigger challenges (Ahadi Kenya Trust,2010). Published Information on knowledge, attitude and practices as well as Jigger situation in public primary schools in Kenya is scanty and fragmented despite having a well focused National Health Policies and Reform agenda. Coupled with this, the Government's goal is to achieve a major national wide impact on hygiene and sanitation related diseases by the year 2015. As a result, there has not been a breakthrough in improving the situation of households entrapped in vicious cycle of Jigger infestation and ill health (Kimani et al, 2012).

As a matter of fact, public health experts warn that heavy tunga penetrans infestations which is an ecto-parasite that causes tungiasis, go beyond mere discomfort and can lead to loss of toe/finger nails, amputation of the digits and could even cause death. (Kimani et al, 2012). Clinical pathological findings carried out by Feidmeier (2003), revealed that victims suffered acute inflammation or painful lesion surrounded by erythema, edema, tenderness, itching, difficulty in walking among others.

According to kimani et al (2012) and Ariza (2012), some of the factors cited as attracting tungiasis in the study areas include: poverty, unhealthy sanitary conditions, social neglect or breakdown of public health measures and having a common resting place outside the house. Of importance to note is that tungiasis has not been a preserve of Kenya only but is also a regional and international problem among the economically challenged.

Actually, approximately 42 percent of Nigeria school children were said to have been infected while the average incidence in Trinidad was 21 percent. Again, in a village in North eastern Brazil, 51 percent prevalence was recorde, (Africa Review, 2008). This unfolding scenario provokes the questions: What is the spread of tunga penetrans infestation in Public primary schools and what effects does the infestation have on academic achievement?

Although Kimani et al 2012 made good attempt to study the knowledge, attitude and practices of household members on Jigger infestation, practices and control within Murang'a district, they failed to grapple the consequences of the same in bedeviling the much awaited vision 2030 in achieving education gains from the public school arena.

The free-living flea is a poor jumper and can only reach a height of around 20cm; therefore, the use of closed shoes (as opposed to sandals or slippers) is an effective way of preventing infection. (Torooti, 2013). Suffice it to say that children are especially vulnerable because they commonly lack shoes in rural areas, so their feet are in contact with soil and dusty floors. Most classrooms are made of mud walls and earth floors, a good habitat for the bugs. (ACE Africa Jiggers Campaign,2012). However, Jiggers take refuge in impoverished communities whether urban or rural. (Grow Bio Intensive Agriculture, Central Kenya, 2011).

As an ectoparasitic skin disease, Tungiasis is caused by the penetration of the female sand flea, Tunga penetrates into the epidermis of the host. It is endemic in developing countries in the tropics, particularly where poverty and poor standards of basic hygiene exist, like in the resource poor communities of South America, the Caribbean and Sub-Saharan Africa, where it is an important but neglected health problem, (Kiprono et al, 2012). Interestingly, some regions often seem to be more prone to Jigger infections than others. That the Jigger flea thrives in dusty, hot surroundings, it would be expected that infestations would be more prevalent in hotter climates. Yet the pests also seem to thrive best in cooler, agricultural regions and in Sub-urban areas. Agricultural or Sub-urban communities are most sedentary and are thus likely to have a high concentration of Jigger fleas in one place, (Africa Review, 2010).

All in all,the effect of global warming, which refers to an unequivocal and continuing rise in the average temperatures of Earth's climate system as a result of increasing concentrations of green house gases produced by human activities, evokes the question of whether there could be a new species of Tunga penetrans. This again,is subject to research investigation. Newly emerged adults are agile, jumpy and crawl on the ground until they locate a suitable host, usually man, pigs, dogs, cats, cattle, sheep and rattus rattus (black rats) are important reservoirs. The dogs and cats act as important reservoirs for the intra- and peridomiciliary transmission of sand fleas.

Both sexes feed on blood but whereas the male soon leaves the host after taking a blood meal, the fertilized female burrows by aid of its sharp and well developed mouthparts into the soft areas of the skin, such as toe webs or under toe nails. The sore, elbows and knees of heavily infested people may also be infected. Notably, the first evidence of infestation by this sand flea is a tiny black dot (lesion) on the skin at the point of penetration. The area around the embedded flea becomes very itchy and inflamed leading to ulcerations, lymphangitis and accumulation of pus (sepsis). When the female flea dies, they remain embedded within the host, frequently causing inflammation and consequently secondary infections. If ignored it may lead to gangrene, auto-amputation of digits, and loss of toes or even death. Understandably, the presence of tunga penetrans infestation especially in the education sector is an hindrance to the achievement of vision 2030 economic target that aims to achieve a GDP(Gross Domestic Product) of 10 per cent beginning 2012.

Kiprono,et al (2012), contends that the natural history of clinical human tungiasis develops in five stages:

Phase 1 starts with penetration of the adult flea into the epidermis, leading to a rigorous inflammation and dilation of blood vessels in the dermis.

In **phase II,** the flea thrusts its head into the superficial layers of the dermis, feeding on blood vessels.The hind part of the flea remains on the skin surface, maintaining communication with the outside. This provides air for breathing and a passage for both excretions and eggs.

During **phase III,** the parasite produces up to 200 white ovoid eggs, causing her body to swell up to 7mm. The insect can now be seen as a yellowish – whitish lesion under a hard hyperkeratotic skin.

Phase IV starts after deposition of the eggs. The female flea dies and the carcass is expelled. During **phase V**, reorganization of the epidermis occurs, taking approximately four weeks, leaving minor residues that will stay for 7 months. Meanwhile, the eggs that were left during **phase III** hatch in three to four days, liberating larvae that develop into pupae. After two weeks, the pupae become adult flea, completing the cycle.

Treatment requires the mechanical removal of the flea with a sterile pin, followed by an antiseptic dressing. Kerosene application kills the flea but results into ulceration of the skin until the dead flea is expelled as found in the

diagrams below;

According to Ahadi Trust Foundation (2010), jiggers have continued to create havoc in rural areas and many school going children have dropped out of school because they are unable to walk. This is equally echoed by Grow Bio Intensive Agriculture Centre, Kenya (2011) and ACE Africa Jiggers Campaign (2012) that expounds how the jigger menace deprives the pupils of concentration in class, affects extra curriculum participation often leaving children lethargic and slow in action. Children are often forced to drop out of school because of inability to walk due to excruciating pain. More often than not, sceptics question whether the jigger dilemma has beaten modern methods of elimination or whether it is just a cosmetic presentation by the agents involved in its eradication.

There is, therefore, a good reason to advance the study on the effects of tunga penetrans infestation on academic achievement in public primary schools in order to realize quality of education that Eshiwani (1993) contends tends to be evaluated in terms of the number of students passing national examinations.

2. Effects of Tunga Penetrans on Education in Public Primary Schools In Kenya

The Government of Kenya in Sessional paper No.1 of 1965 identified relevant and quality education as a means of eliminating poverty, diseases and ignorance while Sessional paper No.1 of 2005 indicates that education is not only a welfare indicator, but also a key determinant of earnings and therefore, an important exit route from poverty. In the vision 2030, the government's focus is to eliminate poverty and empower Kenyans to enjoy quality and decent livelihoods. Education is identified as one of the key component in the social pillar of the Government's Strategy of Vision 2030 (G.O.K 2007). More so, this is informed by the fact that Kenya is a signatory of the World Conference on Education For All (1990) and also the Dakar Declaration on Education for All (2000) (UNESCO, 1997; DFID, 2007).

Conversely, the pursuit of quality in primary education in Sub-Saharan Africa remains elusive and as a result, many African countries continue to grapple with attainment of quality in education (Masanja ,2010). Particularly, when the Narc government came into power in 2003, president Kibaki declared Free Primary Education for all school going children in Kenya. This increased the enrolment rate from 88% in 1993 to almost 100 %(MOEST,2003). This was a positive direction towards the Jomtien conference of attaining education for all, though it posed its own challenges of strained infrastructural availability and inadequate teacher – student ratio, hence compromising quality.(Obiero ,2009). Due to the strained resources, classrooms became crowded, dusty and muddy attracting tunga penetrans habitation among other parasites. According to Uwezo Kenya Survey (2013), despite significant gains in enrolment, pupils are not learning core skills expected at their age and grade level, hence putting into question the education quality.

There remains a number of issues to be addressed revolving around access, participation, retention, completion, transition and achievements for learners in public primary schools in Kenya, which is a source of concern that this article addresses. Clinical pathological findings carried out by Feldmeier, (2003), revealed that victims suffered acute inflammation or painful lesion surrounded by erythema, edema, tenderness, itching, desquamation, hyperkeratosis, fissures, pustules, suppuration, ulcers, deformation of the toes, deformation of nails, loss of nails and difficulty in walking. Moreover, tetanus is a common secondary infection that has reported associations with death in non-vaccinated persons. To this end, this article seeks to elucidate the status of knowledge, attitude, practices and effects of tunga penetrans

infestation on academic performance in public primary schools in, Kenya.

3. World view about Tunga Penetrans Infestation

As a matter of fact, tungiasis is not only a local, national, regional but also an international problem among the economically challenged. A study conducted by Feidmeier (2003) entitled, "Severe Tungiasis in Underprivileged Communities; Case Series from Brazil" revealed that Tungiasis is a common, but neglected health problem in economically depressed communities in South American and Sub-Saharan African countries. Furthermore, the arrival of the sand-flea or Jigger flea (Tunga penetrans) in Africa has been dated in 1872, when the British ship namely Thomas Mitchell – in ballast from Riode Janeiro called at the Angolan port of Ambriz. From there the parasite spread rapidly across the continent, aided by the caravan traffic which brought it from one trading station to the next. A quarter of a century after its first contact with African soil, Oscar Baumann (1898) could report that the sand flea had arrived in Zanzibar, thus completing its transcontinental moves. Besides, Africa Review (2010) notes that jiggers were introduced in the continent in the 1600s by the explorers visiting Africa. The flea had originally come from the West Indies before spreading to other continents. In East Africa, high death rates were noted among soldiers during World War 1 and in Ethiopia during the Second World War as a result of massive jigger infections.

In a study carried out by Ariza, et al. (2012) in Nigeria, entitled, "pigs are the most important reservoir of Tunga penetrans in rural Nigeria," it was observed that among domestic animals and rodents, pigs had the highest prevalence of infestation and highest parasite load at 54.8%, followed by dogs at 45.5%, then rattus rattus(black rats) 29.4% and mus minutoides at 15.4% respectively. Again, of all the tungiasis lesions identified, 83% were found in pigs. This confirms that tungiasis is a zoonotic disease and that pigs are its most important animal reservoir which increases its spread to the community. However, it remains to be found out whether the heavy tunga penetrans infestations in public primary schools are related to pigs' presence in the surrounding environments. This article advances the need for more research in order to fill the identified gaps.

Monitor newspaper (2008),quoted an MP saying all people with jiggers would be arrested "for failing to take care of their bodies" as stipulated by the Public Health Act of Uganda. In South Western Tanzania, pupils from Bitale Primary School in Kigoma District, gave their encounter with jiggers as reported in a blog by Peter Mwangu (Africa Review(2010). Like Kenya, Uganda has a history of ignoring the jigger issue, evidently a menace there. A report by the

Indeed, in Kenya, tungiasis prevalence is dominant in almost all the 47 counties with few isolated cases in Nairobi County. It was in recognition for their dedication towards the fight against jiggers in Kenya that Ahadi Kenya Campaign ambassador Miss World Kenya 2005, Cecilia Mwangi and founder Stanley Kamau were awarded the Head of State Commendation (HSC), by His Excellency Mwai Kibaki, Ahadi Kenya Trust (2009).

Other actors that have joined Ahadi Kenya Trust in fighting the jigger menace include: Spring of Life Initiate, the Grow Bio Intensive Agriculture Centre, ACE Africa Jiggers Campaign , the Government and the Corporate Sector. Nevertheless, a study carried by Kimani et al(2012) on Knowledge, Attitudes and Practices on Jigger Infestation among Household Members aged 18 to 60 years: Case study of a rural location Kenya, established that Tungiasis is usually considered an entomologic nuisance and does not receive much attention and therefore

remains an important health problem for the poor. It is a problem neglected by those affected, the medical profession and the scientific community.

In Ugenya and Siaya districts of Kenya, for instance, it is believed that jiggers infestation is a curse and once infected the individual cannot be cured. (ACE Africa Jiggers campaign, 2012), while a survey conducted in Murang'a County on why the jigger problem still persists in modern Kenya revealed that neighbours who had jiggers are lazy, irresponsible or have the wrong blood group. (Gatonye , 2013).

This article therefore finds import in demystifying the myths by advocating for an investigation on the effects of tunga penetrans infestation in public primary school, thereby making education access, retention, participation, achievement and transition pro-poor.

4. Tunga Penetrans Infestation vis-à-vis Curriculum Achievements

According to Good and SV (1992), Curriculum is a plan that consists of learning opportunities for a specific time frame and place, a tool that aims to bring about behaviour changes in students as a result of planned activities and includes all learning experiences received by students with the guidance of the school. The Education Commission Report (Kochhar, 1993: 281) of India enriches the above definition and states, "We conceive of the school curriculum as the totality of learning experiences that the school provides for the pupils through all the manifold activities, in the school or outside, that are covered on under its supervision." The manifold activities include not only curriculum centered activities but also other co-curricular activities that help children to develop mentally, spiritually and socially. Furthermore, curriculum development is the system of choosing and redefining the content of an education system which may later be implemented in schools. It is also a process of creating curriculum materials for use by educators and children that are a product of curriculum planning (Abiero ,2009).

Maclean (1966) and Little and Thompson (1983) agree that the pupil environment is a factor in academic achievement as the difficulties resulting in failure by the pupils may not necessarily lie with the child but with the educational system and in particular the school. However, there are different parameters that affect passing of national examinations among them personal characteristics of pupils(Thomson & Stanford, 1975; Reinhart, 1976 and Belkin, 1981) and factors related to the pupils' environment – the school and the home(Little & Thompson, 1983).

Report by the Africa Review, (2010), indicate that education has suffered due to tunga penetrans infestation among school children, 50,000 of whom have been forced to drop out of school while many others miss classes because of stigma. This is supported by Kiprono et al (2012), in their study "Tunga penetrans – A silent setback to Development in Kenya," who hold that Jigger infestation affects the education of children because they may be unable to walk to school, write properly or participate in normal learning activities on the same level with other un infested children, resulting to repeated absenteeism or dropping out of school.

Ahadi Kenya Trust, Strategic Plan (2012 – 2014) clarifies that even with the introduction of free primary education, many children were still found at home due to jiggers, several school drop outs as a result of inability to walk and adults who could not attend to their farms due to jiggers hence living in total poverty resulting to disability and incapacity. This has further led to their marginalization and their drawbacks in developmental issues. It is therefore worth noting that although the effects of Tunga penetrans infestation have been narrowed down to public primary schools in this article, they equally have negative implications on the adult populace who cannot exercise their

voting rights due to disability, poverty and in extreme cases, death. They cannot tend to their farms or engage in any income generating project as they are marginalized. Other researchers should therefore conduct a study on the effects of Tunga penetrans infestation among adults in non-learning institutions.

Moreover, kimani et al, (2012) in their study established that in Central province, a total of 1,350 persons suffered from Jigger infestation in one location in Murang'a District, of whom 700 were school going children. The study also revealed that 50% of the infested children do not attend classes. It is rightly within the confinement of these curious scenario that informs the need to assess the effects of Tunga penetrans infestation on KCPE performance in public primary schools in various counties, so as to address possible performance disparities among jigger infested and non-infested learners in public primary schools and thus ameliorate the challenges. This article notes that Tunga penetrans are parasites that distract learners from participating fully in the dimensions of the school curriculum namely; formal, non-formal and informal (Oluoch ,1992).

A pupil who elicits different symptoms of Tunga penetrans infestation such as itching, pain upon pressure, sleep disturbances and walking difficulties, (Njau et al, 2012), stigmatization and ridicule, poverty and in extreme cases death, (Ahadi, Kenya Trust 2009) ulcers and loss of toe nails (Mazigo, 2010), cannot access education or achieve full participation in formal class work. Furthermore, graduating to the next level or completing the school system becomes a hurdle. Non-formal dimension of the school curriculum consists of activities that learners participate in according to their interest, ability or age. Such include; drama, sports, debates and clubs (Oluoch ,1982). As children participate in physical and psychomotor activities, they learn how to communicate verbally. These activities include role play, dramatization and singing to mention but a few. In music and movement, there is clapping, marching, stamping feet, snapping fingers, jumping up and down, according to rhythm and swaying (Wafula , 2010). Such vigorous activities cannot be fully effected where tunga penetrans infestation thrives. This situation compromises curriculum delivery to learners.

The importance of physical activities is that they enhance the function of the central nervous system, promoting the maintenance of lean body tissue, while simultaneously reducing the disposition of fat.(Payne et al, 2002) as quoted in (Wafula , 2010). Similary,informal dimension of the school curriculum is the guided aspect of the unofficial learning activities that go on in the school at a time. This is where a pupil picks desirable habits such as interpersonal skills, respect, hard work, grooming, life skills and character building.(Kithimba et al, 2010).

The article questions whether jigger infested learners have a high self-concept to assimilate the above mentioned traits from their role models in the school environment. This is confirmed by Narang (1981) who argues that academic performance is influenced by the manner in which students get along with friends and classmates and also with the character of their relationship with teachers.

Ahadi Kenya Trust Strategic Plan (2012 – 2014), also advocates for consultative forums with schools and teachers on the victim stigmatization that has consequently led to marginalization. Kimani et al (2012), observed that in Murang'a district, Kenya, the type of dusty earthen floor and the general maintenance of the compound specifically in Gathanje village accelerated tungiasis. However, the researcher lost sight of how this occurrence impacted negatively on school enrolment, retention of learning, participation, achievement and

transition to the next levels, which is the gap that should be sealed by further research so as to develop curriculum theory and practice in improving performance.

Eshiwani(1993), as quoted in Abiero (2009), echoes that theory development can help the Kenya Institute of Curriculum Development(KICD) implement their philosophies of revising the existing curriculum materials and initiating and promoting programmes to improve the quality of education in Kenya. This is in line with the Ahadi Kenya Trust Strategic Plan (2012 – 2014) of working with the Ministry of Education and the Kenya Institute of Curriculum Development in inculcating into the Curriculum hygienic training as will be guided by a training manual to be developed in partnership with Ahadi Kenya Trust.

The question that begs expounding is why Tunga penetrans should be ravaging public primary schools in the 21st century when Kenya is progressing towards vision 2030. Vision 2030 is based on three pillars namely: economic, social and political, (Government of the Republic of Kenya, 2007). The economic pillar aims to improve prosperity of all Kenyans through an economic development programme covering all regions of Kenya to realize a GDP(Gross Domestic Product) of 10% per annum beginning 2012. On the contrary, with tunga penetrans infestation afflicting learners in public primary schools, this may not be guaranteed. The social pillar is about building a just and cohesive society with social equality in a clean and secure environment. Kiprono et al (2012), maintains that the contributing factors to tunga penetrans infestation are poverty, implied by mud walls and earthen floors, walking barefooted, sharing houses with domestic animals and unclean environment. It remains to be established by further investigations whether social equality can be achieved amid learning in tunga penetrans-infested environments. Finally, the political pillar advocates for a democratic political system founded on issue based politics that respects the rule of the law and protects the rights and freedom of every individual in Kenyan Society. Education access, participation, retention, achievements and transition can hardly be realized when learners are subjected to an unequal platform of learning, which further injures implementation of the constitution on the on the bill of rights against discrimination on the basis of gender, religion and social status (Constitution of Kenya, 2010).

Importantly, the primary school education curriculum in Kenya was rationalized and revised in 2002 and subsequently implemented in phases from 2003 to 2006. It addressed several concerns, which included curriculum overload and overlaps within and across subjects; emerging issues such as HIV and AIDS, child labour, environmental degradation and gender issues among others (Kenya Institute of Education, 2010). Nevertheless, it failed to include Tunga penetrans infestation among public primary schools as an emerging issue of concern that Torooti (,2013), says is a condition many look down upon, but has been known to be a menace and a source of misery to those affected.

5. Control Measures Against Tunga Penetrans Infestation

These strategies are derived from reviewed research studies alongside those employed by the Ministry of Public Health and Non-Governmental Organisations.

For effective control of the flea the following needs to be done:

- Victims homes should be thoroughly fumigated using malathion
- Hygiene education for the rest of the family to be administered
- Wearing of shoes to curtail the penetration of the pest into the skin
- Cementing floors of residential houses, classrooms and other

public utilities or smearing where cementing is unaffordable.

- On-host treatment as animals act as reservoirs of the fleas hence fuel peri – and intra-domiciliary transmission of the parasite.
- On-host products such as a combination of imidacloprid and permethrin (Advantix) which prevents infestation with Tunga penetrans in animals.
- Paving streets, cementing floors and eliminating indiscriminate waste disposal in public areas and private compounds since off-host stages of Tunga penetrans develop best in dry soil or in dusty soil containing organic materials. Thus measures aiming to interrupt the off-host development should therefore focus on physically changing the environment in which eggs, pupae, and larva develop (off -host control). The same can be done through focused premise treatment with deltamethrin aimed to interrupt the off-host cycle of Tunga penetrans.
- For optimal efficacy, focal spraying has to be applied at all sites where off-host development occurs especially preferred whereabouts of dogs and cats and shady places under trees or inside houses(for sandy floors).
- Spraying of breeding sites is better done before the parasite population has expanded, i.e at the beginning of the dry season.
- Prevention of the infestation, rather than the surgical extraction of already embedded sand fleas, may interrupt transmission more effectively.
- Zanzarin, a plant-based repellent, has been shown to effectively prevent the infestation with Tunga penetrans in areas with high attack rates. This compound would be an ideal candidate for prophylaxis.
- Adequate tetanus vaccination is required and anti-biotics are also given to prevent secondary infections.
- Treatment of tungiasis consists of local excision or sterile curettage
- Systematic treatment with niridazole 30mg/kg as a single dose is effective in case of multiple sites of infestation.
- Tropical treatment with ivermectin, thiabendazole, metrifonate and niridazole is a successful treatment of the lesions.
- Identification of infested people and referring them to health centres for treatment.
- Neomycin ointment
- Hydrogen peroxide
- Lysol
- Dipping feet in potassium permanganate solution

6. Theoretical Analysis

This article will be guided by aspects of social cognitive theory (Bandura,1986), that falls under the cognitive theory, which explains learning and focuses on what is going on inside the student's mind. The model best illustrates this discussion that is based on intra and inter environmental factors among learners that affect academic achievement in public primary schools. The social cognitive theory gained prominence in the 1980s. They stress that learning and subsequent changes in behavior takes place as a result of interaction between the student and the environment. In this case, learning is influenced by the environment of Tunga penetrans infestation on learners (Kipronos ,2012).

Other significant factors that influence learning and subsequent changes in behavior according to the theory are; cultural factors, peer pressure, group dynamics and film and television. Due to the stigmatization that is vested on the Tunga penetrans learners by their colleagues in schools, the victim's self-concept dwindles (Kimani et al, 2012) hence negatively affecting achievements during evaluation. According to Brown (2000) and Scott (2001), socially rejected or aggressive children appear to be at risk for academic failure. The theory continues to assert that the social environment to which the student is exposed demonstrates or models behavior and the learners cognitively processes the observed behavior and consequences.

In our situation, Tunga penetrans learners are surrounded by varied risk factors such as poor sanitation, symptoms such as stigma, withdrawal syndrome, low self esteem, absenteeism and poor health (Kimani et al, 2012), poverty and habitation with domestic animals (Ariza et al,2012) and other Tunga penetrans infestation obstructing cognitive processes in learning, which include: attention, retention, motor responses, and motivation. Techniques for learning in the social interaction theory include direct modeling and verbal instruction. Tunga penetrans infested learners are limited from actively participating in modeling or verbal interactions during learning, which negatively affects their academic performance. Behaviours, personal factors, and environmental events all work together to produce learning.

In his study involving 72 empirical studies of students' achievements worldwide, Fuller (1986) found achievement to be significantly related to the length of time a student is in contact with the teacher, teachers tertiary training and availability of instructional material.

Again, Abagi & Odipo (1997), in their study that investigated the efficiency of primary school education in Kenya, found that children whose parents were unable to afford cost of instructional materials among other requirements tended to go to schools irregularly, which in the long run affected their performance in national examinations.

7. Application

This article has established the effects of Tunga penetrans infestations on academic achievement in public primary schools in Kenya. The article may enrich the Kenya Institute of Curriculum Development (KICD) in revising the existing curriculum content, preparing new and relevant curriculum materials and designing programmes for dealing with disruptive behavior towards learning and reducing the wastage (drop out) as a result of Tunga penetrans infestations.

The discussion may also have both theoretical and practical implications for the future of Kenya Certificate of Primary Education performance in public primary schools in the country. Theoretically, the study is expected to contribute to the advancement of knowledge about curriculum development on Tunga penetrans infestations and remedies and in public primary schools in Kenya. The knowledge may be of immediate benefit to the Ministry of Education Science and Technology (MOEST) in the formulation of future policies aimed at enhancing creation of Tunga penetrans – free learning institutions to boost formal, informal and non-formal dimensions of curriculum.

8. Conclusions

It has been confirmed from the literature reviewed that Tunga penetrans infestation may hamper the victims exploitation of their potential, more so, adults as they cannot participate in day to day self and community development activities. The disability and incapacity due to Tunga penetrans infestation may

have led them to be marginalized in addition to causing poverty. They have also been unable to exercise their constitutional rights of voting among others.

The infestation among adults has a trickle-down effect on their children who are learners in schools. Tunga penetrans infestation is shrouded in myths among some victims. The infestation is not only found in Kenya but also Africa and other poverty stricken European countries. Studies done on the knowledge, attitude and practices on Jigger infestation among household members of a rural location in Kenya have failed to focus on the implication of the infestation in the field of education, blurring the achievement of vision 2030. Correspondingly, other studies done on habitation of the parasite on certain domestic animals in rural areas have not explained the causes of the infestations in schools. In a nutshell,Tunga penetrans infestation has revealed glaring retrogressive impacts on learner's access, participation, retention, achievements and transition in education

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