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Tunga penetrans, Pediculus capitis and *Sarcopte scabei* infestations among Children <15yrs in Kamagut Location, Uasin Gishu District, Kenya

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Tunga penetrans, Pediculus capitis and *Sarcopte scabei* can cause itching and irritation on affected human skin, hence predisposing to secondary bacterial infections particularly serious in children. The study was carried out in a rural medical clinic in a semi-arid location with poverty-stricken population in Kamagut location, Uasin Gishu District, Rift Valley Province, Kenya. The target group consisted of School-going and non-school-going children aged fifteen and below, enrolled in the study, while they underwent treatment in the rural medical clinic. The objectives concurrently were to determine the prevalence and the predictors of *T. penetrans, S.scabei* and *P. capitis* infestations among the children aged 15 and below who were affected by the parasites. The prospective cross-sectional study was done between June, 2006 and December, 2006. When143 children aged 15yrs and below were enrolled for the study as they received the appropriate medical attention. The results of the study showed that the prevalence of *S. scabei, T. penetrans* and *P. capitis* infestations were 34.3%, 21% and 15.4%, respectively. Inadequate water for bathing and domestic use was a significant predictor of high *S. scabei* infestation (OR=7.446, p= 0.015) and the same applied to overcrowding (OR=7.584, p=0.011) as a significant predictor of high *P.capitis* infestation (OR=2.287, p=0.04). Prevalence of the ectoparasites was significantly higher among non-school than school-going children ($p < 0.05$). *T. penetrans* infestation was significantly common among children without shoes and those more exposed to overcrowding ($p<0.05$). *S.scabei, T.penetrans and P.capitis* infestations are significantly high among children in the study area, partly due to overcrowding that predisposes them to the spread of the parasites. Children without shoes were more predisposed to *T. penetrans* infestation than those with shoes. Measures to avoid overcrowding among children and to encourage them to wear shoes should be instituted. Research to establish the effects and/or consequences of the high prevalence of ectoparasites in the study area is recommended.

Keywords: *Pediculosis capitis*, prevalence and *S. scabei; T. penetrans*

Introduction

In most developing countries, especially those in Africa, research of some human parasites remain neglected (Ayaya, *et al.,* 2001); hence reliable epidemiological data on some of the human ectoparasites are generally lacking in such countries (Bender and Miniculli, 2007; Blanchard, 1899). To partly bridge this knowledge gap, the study was designed to determine the prevalence and predictors of *S. scabei, T. penetrans* and *P. capitis* infestation among children aged fifteen and below, who were screened for the selected ectoparasites

during the period between June, 2006 and December, 2006, at a medical clinic in Uasin Gishu District, Kenya. *S. scabei, T. penetrans* and *P. capitis* cause scabies, Tungiasis (jiggers infestation) and *pediculosis* (head lice) infestation, respectively. The parasites cause itching and/or irritation on the human skin, causing the affected person to scratch it; hence the scoured skin, is then predisposed to potentially dangerous secondary bacterial infections. Secondary bacterial infections, such as tetanus and Beta haemolytic streptococcal skin or throat infections have high mortality, especially among children in Sub-Saharan Africa (C.D.C, 2007; Heukelbach,et al., 2001; Heukelbach and Feldmeier, 2002). Some of the infestations especially, pediculosis and tungiasis, also have a significant impact on the quality of life and the learning ability of the affected school children owing to anxiety, embarrassment, social stigma (Muehlen, et al., 2006; Leppard and Naburi, 2000) and even truancy that may be correlated with the exclusion of affected children from school (Mirmirani, et al., 2002). Corneal damage may be caused by pediculocides during treatment of pediculosis (Pe're and BenEzra, 1998). Since most of the diseases associated with ectoparasites are transmitted more easily in overcrowded situation and poor hygiene, such diseases can therefore be prevented through adequate personal, environmental and water hygiene and sanitation (Price, et al., 1999; Rukunga, 2001; Schmeller and Dzikus, 2001; Scott, et al., 2004).

Materials and Methods

Study Area and Population

The medical clinic in which the prospective cross-sectional study was done is situated almost at the centre of Turbo Division, Uasin Gishu district in Rift Valley, Kenya. Turbo division is at an altitude of about 1800 metres above sea level on averageand covers an area of about 321.2 square kilometres. Temperature ranges from 8.4 degrees Celcius to 26.1 degrees Celcius. It is also a semi-arid area that is prone to prolonged drought causing frequent water and food shortage (Uasin Gishu District Development Plan, 2002-2008). The area is mainly inhabited by a poorly endowed population rendering many school children to drop out of school prematurely due to lack of basic school amenities. This area had population densities of 340, 376, 402 and 459.6 in 1999, 2002, 2004 and 2008, respectively (Uasin Gishu District Development Plan, 2002-2008); the population is also exposed to diseases associated with poor personal and environmental hygiene owing to scarcity of health facilities. While food and poverty depicts upward trend for both rural and urban areas of Uasin Gishu District, hard-core poverty levels have been constant. Those vulnerable to poverty in Uasin Gishu include the youth (including children and orphans in difficult circumstances), women and the elderly. Poverty has been worsened by the impact of HIV/AIDS whose preliminary findings indicated a prevalence of 6.8% in 2008 (Uasin Gishu District Development Plan, 2002-2008; Uqbomoiko, et al., 2007). Socioeconomic consequences of the disease are enormous and have rendered children as young as 10 years to become orphans; hence such are left to fend for themselves and their siblings. This has leading to high school drop-out rate and increase in child labour and abuse. The Uasin Gishu District enrollment rate for primary school children in 2008 was 8.8% and 90.5%, while the school drop-out rate was 2.4% and 2.1%, for boys and girls, respectively (Uasin Gishu District Development Plan, 2002-2008).

Study design

The prospective cross-sectional survey design was chosen because the study involved description of observations made at one point in time.

Subjects

A total of one hundred and forty three (143) children aged fifteen and below who met the inclusion criteria were concurrently enrolled during the study, from among the patients treated at the medical clinic during the period between June 2006 and December 2006.

Inclusion and Exclusion Criteria

All children aged fifteen and below were included in the study, provided consent for their participation was obtained from their parents /guardians. The parents /guardians who gave consent had to sign in an appropriate form after receiving adequate explanations and reading through the ethical approval documents that were provided to them prior the signing of consent forms for the study.

Data Collection and analysis

A structured questionnaire containing spaces to fill in the age, gender, school attendance or non-attendance was provided to the parent/guardian of each child enrolled for the study. Information about the child's regular wearing of shoes, drying of feet after bathing, means of transport to and from school, source and accessibility to adequate water, accessibility of latrines and healthcare facilities to the children was sought so as to identify the predisposing factors to various parasites considered for the study. The number of siblings of the child and other family members within the family were also noted to detect the predisposal to overcrowding. The questionnaire also captured information on whether the family of the child lived in a temporary, semi-permanent or permanent house, in order to ascertain if the type of housing is among the significant predictors of some of the parasites considered for the study. The highest education achieved by the parent/guardian was also recorded to identify any role it might play in the knowledge of preventive measures of various parasites considered for the study. After the history taking and the appropriate physical examination to confirm the physical evidence of the parasites, the child was then sent to the laboratory for microscopic examination of specific specimens by a qualified laboratory technologist. Scabies was diagnosed from history of itchy lesions between fingers and the whole body except the face, with laboratory confirmation of faecal pellets, eggs and female mites from intra-dermal lesions seen under microscopy. The skin suspected or seen to have scabies was scrapped, after applying a drop of mineral oil directly onto the affected skin. The scrappings in the oil was then transferred onto a slide covered with a cover glass then examined under a 10X microscope lens. Mounting the scrapings on oil was to enable movement of mites to be seen clearly. Presence of nits or adult head lice in the scalp hair of a child formed the clinical evidence of *Pediculus capitis*, while lesions on soles of feet, toes or fingers with itchy lesions or painful swellings under the skin, or the manual removal of adult gravid female containing eggs, showed clinical evidence of tungiasis. The data were then assembled, summarized by tables, bar graphs and other appropriate statistical presentations then analyzed using the Statistical Package for Social Sciences (SPSS), version 12. Chi-square and logistic regression methods were used for data analysis.

Results

The socio-demographic characteristics for the children affected by the selected parasites are shown in Table 1.

Table1: Socio-demographic characteristics of the children with Scabies, Jiggers and Head lice

Variable		Number	Frequency (%)
Gender	Male	66	45.7
	Female	77	54.3
Age	<5 years	18	12.2
	5-9years	33	22.9
	10-15years	92	64.9
School status of Children	School-going children	93	65
	Non-school going children	50	35
Scabies (*S. scabei*) infestation	School-going children	29	20.3
	Non-school going children	20	14
Jiggers (*T. penetrans*) infestation	School-going children	2	1.4
	Non-school going children	28	19.6
Head lice (*P. capitis*) infestation	School-going children	5	3.4
	Non-school going children	14	9.8

The overall prevalence of *S. scabei*, *T. penetrans* and *P. capitis* was 34.3%, 21% and 15.4%, respectively. The infestation with *S. scabei* was higher among school-going than non-school going children while *P. capitis* and *T. penetrans* were more prevalent among the non-school going children. As shown in figure 1, children aged 10-15 years and 5-9 years had higher frequency of scabies (18.9% and 12.6% , respectively) than those aged <5 years (whose frequency was12.6%) but the age difference was not a statistically significant factor for scabies infestation ($p>0.05$).Tungiasis (*T. penetrans*) more significantly ($p=0.002$) affected children aged 5-9 years (frequency of 9.8%) than those aged <5 years and 10-15 years (either age group with a frequency of 5.6%). Pediculosis (*P. capitis*) affected boys (whose frequency was 7%) than girls (6.3%) but the difference was not statistically significant ($p>0.05$). No significant difference with respect to gender was noted ($p> 0.05$) among the children by the selected parasites (figure 2).

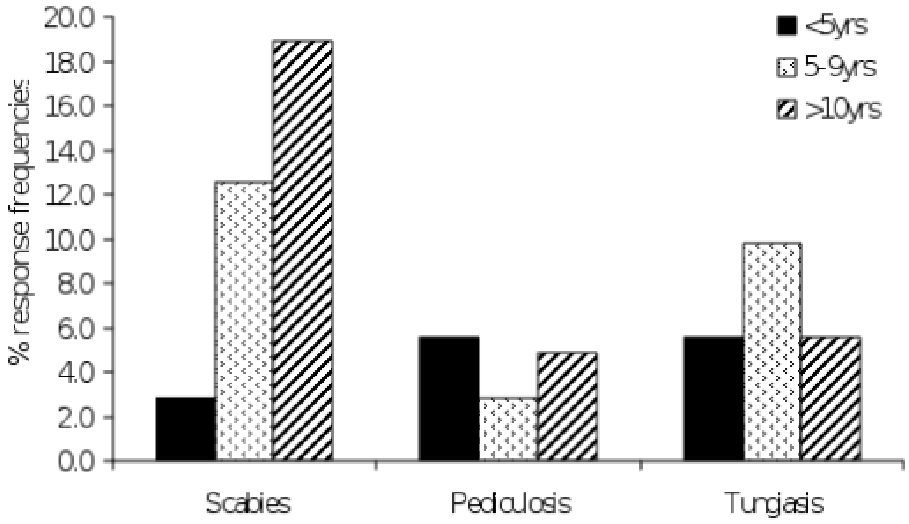

Fig. 1: Prevalence of scabies, pediculosis and Tungiasis in children of various age groups

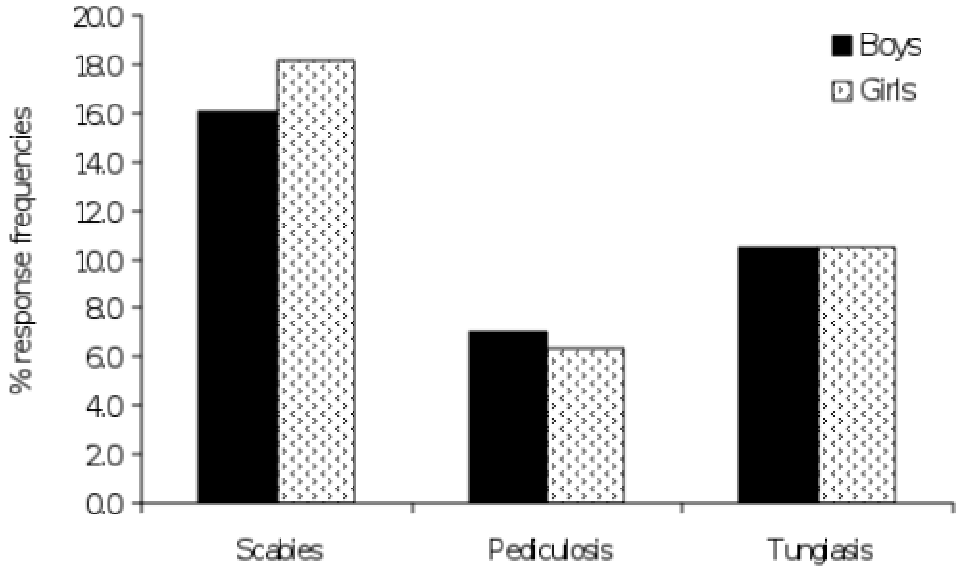

Fig. 2: Prevalence of scabies, pediculosis and Tungiasis in children of different gender groups

Inadequate water for bathing and domestic use was a significant predictor of high *S. scabei* prevalence (OR=7.446, p= 0.015) and the same applied to overcrowding (OR=7.584, p=0.011). Living in overcrowded dwellings was a significant predictor of high *P. capitis* prevalence (OR=2.287, p=0.04). A significant ($p<0.05$) number of the children who lived in overcrowded houses also wore no shoes. Wearing of shoes significantly ($p< 0.05$) affected the prevalence of *T. penetrans*. Children with shoes had lower prevalence (17.0 %) of *T. penetrans* than those without shoes (32.1%). Inadequate water for bathing and washing clothes and clean latrines also significantly affected the prevalence of *Pediculosis capitis* ($p< 0.05$).

Discussion

The significantly high infestation of *Sarcopte scabei* that causes scabies and *Pediculus capitis* that caused pediculosis was due to poor personal and environmental hygiene that the affected children were exposed to. However, *S. scabei* was more prevalent than the other ectoparasites considered for the study, mainly because *S.scabei*, is spread by direct contact between infected persons; in one past study the spread of the parasite occurred more easily among overcrowded prisoners (Price, et al., 1999). A different study in Kisumu district found that scabies infection recurred among school children, despite earlier prevalence reduction following successful treatment (Rukunga, 2001). Itching and irritation of the skin by *S.scabei* and *T.penetrans* may predispose to secondary bacterial infections, including those that cause long-lasting renal damage or tetanus; hence this is one reason to worry about the high prevalence of these ectoparasites in the study area. Furthermore, some of the parasites may persist even for long, provided the environmental conditions remain favourable. Scabies infestation has been in East Africa, Madagascar and other parts of Africa for over a century and the poor state of environmental hygiene among neglected children in rural populations, such as those in the study area or even among the street children in urban populations (Ayaya, *et. al*, 2001; Vessey, 2000) should also be of concern to health care workers and the population they treat. Negligence of ectoparasites is indeed common among the communities of low socioeconomic status, especially in Sub-Saharan Africa (White, et al., 2001).

One possible reason why older children had a higher prevalence of scabies and pediculosis than younger ones was because most parents/ guardians and teachers more directly supervised the personal hygiene of younger children, while the older ones are usually left with the responsibility of cleaning themselves. Children who are therefore given the responsibility toclean themselves may end up neglecting thorough cleanliness. The significantly high prevalence of *P.capitis* was due to inadequate water for bathing, washing of clothes and cleaning of latrines, as reflected by the results of logistic regression. The nymphal stage of *P. capitis* can survive up to 48hours in the absence of the human host while viable nits survive for several weeks on clothing or in pillows (Williams, et al., 2001). The long period of survival of viable nits also favours their spread among overcrowded children; hence this may partly explain why *P. capitis* was detected among some of the children, despite the supervision of their cleanliness by their care takers. It is also noteworthy that the current study was done during the transition period when many children who had otherwise dropped out of school had gradually returned to school because of the introduction of free primary school education in Kenya, which has consequently caused overcrowding in some schools. Most of the children who lived in the temporary or semi-permanent but overcrowded dwellings also wore no shoes, thus got more exposed to tungiasis; caused by *T. penetrans*, therefore explaining the significant difference between the higher prevalence of *T. penetrans* among children without than those with shoes.

Conclusion

The parasitic (*S.scabei, T.penetrans and P.capitis*) infestations were significantly high among children in Turbo Division, Uasin Gishu District; hence the affected children are at risk of contracting potentially dangerous secondary bacterial infections. Overcrowding predisposes them to increased infestation of children with *S. scabei, T. penetrans* and *P.capitis*. Children without shoes are more predisposed to *T. penetrans* than children with shoes.

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