Information, Education, Communication (IEC) and parasite infections in children

A longitudinal effectivity study in public primary schools in the Central Region of Togo,

West Africa

Dissertation

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GBANDI GANTIN

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Dekan:	Prof. Dr. Wolfgang Rosenstiel
1. Berichterstatter:	Prof. Dr. Martin Hautzinger
2. Berichterstatter:	Prof. Dr. Peter Soboslay

1. ***Acknowledgments***

Since several years, our activities in Sokodé/Togo and in Tübingen were focused on parasite field research and have been mainly oriented on onchocerciasis control and on tropical neglected diseases (NTDs) mainly working with adults and school-age children. During these works in Togo, we graduated numerous students, accomplished bachelors, master degrees and theses for Togolese and German students in medicine and biology. Within theseactivitiesI have expressed my idea to realizemy thesis based on the experiences obtained from different works and from observations I have made in primary schools in the central region of Togo during our missions. This idea matured and works were accomplished and the results are summarized in the present doctoral thesis.
As it is in such a situation, this work would not have been possible without the support of colleagues and friends and especially without the inter-university cooperation between the University of Tübingen and the University of Lomé in Togo.
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2. *Summary*

The present research is based on the "Hygiene and School Health" project aiming at strengthening the capacities of school children aged 5 to 15 years to take better care of their health, and at improving the physical environment of public primary schools (EPP). For this, in the central region of Togo 106 schools were identified in semi-urban and rural environment. Parasitological surveys and analyzes, de-worming campaigns and health education (IEC) were performed for several years in the study group (EPP-IEC), while the control group (EPP-Plan1) had not benefited from these measures. For the information education and communication (IEC) courses, information materials (posters, leaflets, manuals) were developed for teachers and school children. The IEC materials contained essential information to understand pathogens, their transmission, the diseases they cause, prevention, vaccination and important aspects of personal and school based hygiene. The IEC courses were first applied to teachers and then they transmitted the aspects of pathogens, disease and hygiene to their pupils. A questionnaire was applied to assess school children's knowledge on health and school hygiene issues. IEC courses were repeated at least once each year by the teachers and in parallel deworming campaigns were performed. The pupils' knowledge was evaluated repeatedly for several years. Collected stool and urine samples were analyzed for the presence of intestinal and intravascular parasites and schistosomiasis using urine sedimentation and the Kato-Katz methodology.

At the beginning of the study hookworm and schistosomiasis infection intensities were high (above 1000eggs/g stool and >300eggs/10ml urine). At year 7 post intervention, the mean infection intensities decreased significantly in treated children. Initially,in the study group 59.3% (n=755) and 37.9% (n=627) were positive for hookworm and schistosomiasis. Following de-worming and repeated IEC and after years, the prevalence of hookworm infection and urinary schistosomiasis (in the EPP-IEC group) decreased to 17.34% (year 5), 12.62% (year 6) and 25.40% (year 7) (Table 9), and to 9.36%(year 5), 19.70% (year 6), 10.85% (year 7) (Table 10) for urinary schistosomiasis. However, the infection prevalence remained high in both groups (EPP-IEC and EPP-Plan1), i.e. 46.7% (n=2324) (Table 5) with hookworm, and 22.9% (n=8942) for urinary schistosomiasis (Table 6). Of note was that children were often poly parasitized in the both study groups with hookworm and schistosomiasis.
At the beginning of the study, the number of known diseases was n=3, the knowledge and purpose on vaccination was n=2, the understanding for hygiene measures was low (n=1) and specific infections (hookworm, ascaridiose, onchocercose) were not known. In all aspects mentioned and after IEC application for several years a significant larger knowledge (scores) were present and measurable by questionnaire in the study group.
The knowledge scores in health and school hygiene in EPP-Plan school children were lower compared to the EPP-IEC group. The comparison of these groups disclosed significant difference in most of the questionnaire aspects: known diseases, diseases causes and symptoms, and on diseases prevention and cure options. Strong negative correlations were also seen for associations of knowledge scores on health aspects with intestinal helminth infection levels (i.e. intensity of hookworm infections and poly parasitism in children).

These dependencies showed that the better school children knowledge on health aspects and hygiene, the less parasite infections and poly parasite infections will be present in schools. The results from the present study indicate that education from age 5-15 years will improve and augment knowledge on parasitic diseases and hygiene, and such early education (IEC in school children) has a huge impact on the prevention of these diseases.

*3. **Zusammenfassung***

Die vorliegende Arbeit basiert auf dem „Hygiene and School Health"-Projekt, das sich zum Ziel setzt bei Schulkindern zwischen 5 und 15 Jahren Kompetenzen im Fokus auf die eigene Gesundheit zu stärken, sowie das physische Umfeld von öffentlichen Grundschulen (EPP) zu verbessern. Im Zuge dessen wurden in der Region Centrale in Togo 106 Schulen in urbanem, semi-urbanem und ländlichem Umfeld identifiziert. In der Studiengruppe (EPP-IEC) wurden parasitologische Untersuchungen, Analysen, Entwurmungskampagnen und Gesundheitsbildung (IEC) über einige Jahre durchgeführt, während die Kontrollgruppe (EPP-Plan1) nicht aus diesen Parametern profitierte. Für die Bildungsprojekte und Kommunikationskurse (IEC) wurden Info-Materialien (Poster, Broschüren, Handbücher) für Lehrer und Schulkinder entwickelt. Die IEC Materialien beinhalteten essentielle Informationen zum Verständnis von Pathogenen, deren Übertragung, den entsprechenden Krankheiten, Prävention, Impfung und wichtige Aspekte der persönlichen und Schul-basierten Hygiene. Die IEC-Kurse wurden zunächst bei Lehrern angewandt, welche daraufhin die Aspekte der Pathogene, Krankheiten und Hygiene an die Schüler überlieferten. Ein Fragebogen wurde angewandt um die Bildung der Schüler über Gesundheit und Schul-Hygiene zu beurteilen. IEC Kurse wurden mindestens einmal von den Lehrern wiederholt und parallel wurden Entwurmungskampagnen vollzogen. Die Intensität von Hakenwurm und Schistosoma-Infektionen und die Bildung der Schüler wurden über einige Jahre wiederholt untersucht. Gesammelte Stuhl und Urin-Proben wurden nach dem Auftreten von intestinalen und intravaskulären Parasiten untersucht. Für Schistosoma-Untersuchungen wurden Urin-Sedimentation und die Kato-Katz Methode angewandt.

Zu Beginn der Studie lagen die Intensitäten der Hakenwurm und Schistosoma-Infektionen im Mittel bei 1437 Eiern/g Stuhl sowie 391 Eiern/10 ml Urin. Im siebten Jahr der Intervention fielen die Intensitäten der Infektionen im Mittel auf 15 Eier/10 ml Urin sowie 328 Eier/g Stuhl in den behandelten Kindern. Anfangs waren in der Studiengruppe 59,3% (n=755) und 37,9% (n=627) positiv für Hakenwurm und Schistosoma-Infektionen. Nach Jahren der Entwurmungskampagne und wiederholten IEC Anwendungen fielen die Prävalenzen der Hakenwurm-Infektionen (in der EPP-IEC Gruppe) auf 17,34% (5 Jahre), 12,62% (6 Jahre) und 25,40% (7 Jahre)(siehe Tabelle 9), sowie der Schistosoma-Infektionen auf 9,36% (5 Jahre), 19,70% (6 Jahre), 10,85% (7 Jahre)(siehe Tabelle 10). Die Prävalenzen blieben jedoch in beiden Gruppen hoch (EPP-IEC und EPP-Plan1), im gegebenen Fall 46,7% (n=2324)(Tabelle 5) bei Hakenwurm-Infektionen, und 22,9% (n=8942) bei Schistosoma (Tabelle 6). Zudem waren Kinder beider Studiengruppen oft poly-parasitiert mit Hakenwurm und Schistosoma-Infektionen.

Zu Beginn der Studie die Anzahl der bekannten Krankheiten war n=3, Kenntnis und Zweck von Impfungen bei n=2, das Verständnis über Hygiene-Parameter war gering

(n=1) und bestimmte Infektionen (Hakenwurm, Ascaridiose, Onchozerkose) waren teilweise nicht bekannt. In Bezug auf die erwähnten Aspekte und nach IEC Anwendung über einige Jahre war ein signifikant größeres Wissen (Scores) präsent und messbar durch Fragebögen in der Studiengruppe.
Wissensstand in Gesundheit und Schulhygiene in EPP-Plan Schulkindern war verglichen zu EPP-IEC Gruppen geringer. Der Vergleich von diesen Gruppen legte signifikante Unterschiede in den meisten Aspekten der Fragebögen offen: bekannte Krankheiten, Krankheitsursachen und Symptome, sowie Prävention und Behandlungsmöglichkeiten. Stark negative Korrelationen wurden auch bei dem Wissensstand von Gesundheitsaspekten mit intestinalen Helminthen-Infektions-Niveaus beobachtet (im genaueren für die Intensität von Hakenwurm Infektionen und poly-Parasitosen bei Kindern).
Diese Abhängigkeiten zeigten, dass besser Schulbildung über Gesundheitsaspekte und Hygiene zu weniger Parasiten-Infektionen in Schulen führen. Die Ergebnisse der vorliegenden Studie implizieren, dass die Lehre bei 5 bis 15-jährigen die Kenntnisse über parasitäre Infektionen und Hygiene verbessert, und dass eine frühe Lehre (IEC bei Schulkindern) einen großen Einfluss auf die Prävention dieser Krankheiten hat.

4. ***Résumé***

La présente recherche est basée sur le projet «Hygiène et santé scolaire». Elle vise à renforcer les capacités des écoliers âgés de 5 à 15 ans à mieux s'occuper de leur santé et à améliorer l'environnement physique des écoles primaires publiques (EPP). Dans ce contexte, dans la région centrale du Togo, 106 écoles ont été sélectionnées dans les milieux semi-urbains et ruraux. Des enquêtes et analyses parasitologiques, des campagnes de déparasitage et l'éducation pour la santé et pour l'hygiène en milieu scolaire (IEC) ont été réalisées pendant plusieurs années dans le groupe d'étude (EPP-IEC), tandis que le groupe contrôle (EPP-Plan1) n'a pas bénéficié de toutes ces mesures. Pour les cours d'information, éducation et communication (IEC), des documents (affiches, dépliants, manuels d'éducation) ont été développés pour les enseignants et pour les écoliers. Ces supports destinés à l'IEC contiennent des informations essentielles pour la connaissance les agents pathogènes, leur mode de transmission, les maladies qu'ils causent, la prévention, la vaccination et les aspects importants de l'hygiène personnelle et scolaire. Les cours d'IEC ont d'abord été dispensés aux enseignants qui les ont ensuite transmis à leurs élèves dans les différentes écoles. Ces cours ont portés sur les pathogènes, les maladies et sur l'hygiène en milieu scolaire. Un questionnaire a été élaboré et appliqué aux élèves pour évaluer leurs connaissances sur les problèmes de santé et sur l'hygiène en milieu scolaire. Les cours d'IEC ont été dispensés au moins une fois par les enseignants aux élèves et des campagnes parallèles de déparasitage ont été effectuées dans les écoles du groupe d'étude (EPP-IEC). L'intensité des infections à l'ankylostomiase et à la schistosomiase et la connaissance des élèves ont été évalué de façon répétitives et pendant plusieurs années. Les échantillons de selles et d'urines collectés ont été analysés pour détecter la présence de parasites intestinaux et intravasculaires par la méthodologie Kato-Katz pour les échantillons de selles et à l'aide de la technique de sédimentation pour les échantillons d'urine.
Au début de l'étude, les intensités des infections à l'ankylostomiase et à la schistosomiase étaient respectivement de 1437 œufs/g de selles et 391 œufs/10ml

d'urine (moyenne) chez les enfants. Au cours de la 7e année d'étude (après intervention), les intensités moyennes d'infection ont diminué à 15 œufs/10 ml d'urine (schistosomiase) et à 328 œufs/g de selles (ankylostomiase) chez les enfants traités (EPP-IEC). Initialement, dans le groupe d'étude, 59,3% (n=755) et 37,9% (n=627) étaient positifs respectivement pour l'ankylostomiase et la schistosomiase. Après plusieurs années de déparasitage et de répétition des séances de l'IEC, la prévalence de l'ankylostomiase et de la schistosomiase urinaire (dans le groupe EPP-IEC) a diminué à 17,34% (année 5), 12,62% (année 6) et 25,40% (année 7) (Tableau 9) pour l'ankylostomiase et à 9,36% (année 5), 19,70% (année 6), 10,85% (année 7) (tableau 10) pour la schistosomiase urinaire. Cependant, la prévalence de l'infection est restée élevée dans les deux groupes (EPP-IEC et EPP-Plan1), soit 46,7% (n=2324) (tableau 5) avec l'ankylostomiase et 22,9% (n = 8942) pour la schistosomiase urinaire (tableau 6). Il faudra aussi noter que les enfants étaient souvent parasités chez les deux groupes d'étude avec l'ankylostomiase et la schistosomiase.

Au début de l'étude, le nombre de maladies connues était n=3, la connaissance et l'importance de la vaccination était de n=2, la compréhension des mesures d'hygiène était faible (n=1) et les infections spécifiques (ankylostomes, ascaridiose, onchocercose) étaient pratiquement inconnus. Dans tous les aspects mentionnés et après l'application des cours d'IEC pendant plusieurs années dans les écoles suivies, des connaissances significatives (scores) s'étaient développées et sont mesurable par questionnaire dans le groupe d'étude.

Les notes (scores) obtenues sur les connaissances sur la santé et l'hygiène en milieu scolaire chez les élèves de l'EPP-Plan (groupe control) étaient plus faibles par rapport au groupe EPP-IEC. La comparaison de ces deux groupes a révélé une différence significative sur la plupart des aspects contenus dans le questionnaire: maladies connues, causes et symptômes des maladies, et sur les options de prévention et de guérison de ces maladies.

De fortes corrélationsnégatives ont également été observées pour les associations entre les notes obtenues pour les connaissances sur les aspects de la santé avec des niveaux d'infection par les helminthes intestinaux (c'est-à-dire l'intensité des infections à l'ankylostomiase et poly parasitisme chez les enfants).Ces dépendances ont montré que, lorsque les connaissances des enfants sur les aspects de la santé et l'hygiène en milieu scolaire sont meilleures, les infections parasitaires et les cas de poly parasitisme dans les écoles sont bas. Les résultats de la présente étude indiquent que l'éducation(IEC) en matière de la santé et de l'hygiène en milieu scolaire chez les enfants d'âge scolaire permettrait d'améliorer leurs connaissances sur les maladies parasitaires et leur permettrait d'adopter les bonnes pratiques des règles d'hygiène. Ces résultats montrent que l'éducation précoce (IEC chez les écoliers) a un énorme impact sur la prévention ultérieure des maladies parasitaires.

I. INTRODUCTION

1.1. Geo-helminthes and Schistosomiasis

1.1.1 Geo-helminthes

Geo-helminthes, also named soil-transmitted helminthes (STH) are transmitted primarily through contaminated soil and have a direct life cycle which requires no intermediate hosts or vectors. The infection occurs through soil, foods or water supplies contaminated by feces. The adult geo-helminthes are mainly parasites in humans, but also infect animals, which may represent a zoonotic parasite reservoir. The juvenile third-stage larvae is the infective form. The persistence of geo-helminthes in their host causes clinical disease manifestations which can be both local and systemic. The major helminthiases caused by geo-helminthes are: ascaridiasis (*Ascaris lumbricoides*), whipworm infection (*Trichuris trichiura*) and hookworm infections (*Ancylostoma duodenale* and *Necator americanus*) (Bethony et al. 2006). The mode of transmission for STH includes: ingestion of undercooked or unwashed food, contaminated water and soil; living or walking barefoot in villages without latrines where people defecate or where human feces is used as fertilizer; ingestion of dirt and sand by children. The prevalence of STH is generally underestimated in Africa. Large heterogeneity of prevalence is presented from one location to another, even in the same region. It is estimated that geo-helminthes cause 135,000 deaths every year, and persistent infection of more than two billion people (WHO, 2004). A study has been conducted to determine the prevalence, intensity of infection and risk factors associated with *Schistosoma mansoni* and soil-transmitted helminthes infections among school children and a pre-tested questionnaire was used to collect socio-demographic information, it showed that *S. mansoni* infections are highly prevalent in the islands whereas the prevalence of soil-transmitted helminthes is low (Mugono et al. 2014). In Brazil, the prevalence and risk factors for giardiasis and soil-transmitted helminthiasis was studied. The results showed giardiasis and STH still persist, infecting people who have good housing conditions and free access to public health care and education (Pinheiro et al. 2011).

Ascaris lumbricoides is an intestinal parasite of humans. Its life cycle is shown in Figure 1. This worm infects only humans and is more common in tropical countries. Adult female worms can reach 20-35 cm in length, adult males 15 to 30 cm. It is the largest nematode that infests humans. *A. lumbricoides* is cosmopolitan, but is more common in tropical and subtropical areas and especially in those with inadequate hygiene conditions. Indeed, its spread is favored by tropical heat, humidity and lack of hygiene.

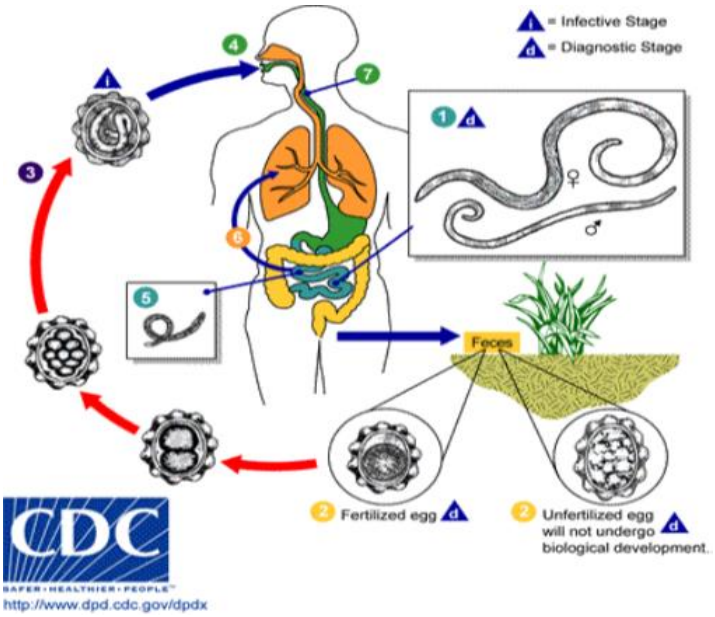


Figure 1. Life cycle of Ascaris lumbricoides

Image adapted from https://www.cdc.gov/parasites/ascariasis/biology.html

Adult worms (1) live in the lumen of the small intestine. A female can lay about 200,000 eggs a day, which are evacuated with feces 82). Fertilized eggs develop embryos and become infectious between 18 days to several weeks (3), depending on the environmental conditions (optimum: moist, warm and shaded soil). Following ingestion infectious eggs (4), larvae hatch (5), invade the intestinal mucosa and are transported through the portal, and then systemic circulation to the lungs (6). Larvae mature further into the lungs (10-14 days). They penetrate the alveolar walls, ascend the bronchial tree to the throat and are then swallowed (7). The larvae develop in adult worms when they reach the small intestine. Hookworm infections are a cosmopolitan digestive helminthiasis, caused by two nematodes *Ancylostoma duodenale* and *Necator americanus*. Its life cycle is shown in Figure 1. It occurs in all warm and humid countries, and affects nearly a quarter of the world population, often causes infections with massive blood loss and pernicious anemia in the tropics (Yong et al. 2014).

Hookworm infection may have severe consequences, such as malnutrition and cognitive disorders (WHO, 2004). Its influence can be dramatically different in young children who are particularly vulnerable or women at child-bearing age; hookworm infections cause anemia premature, births and maternal mortality (Matangila et al. 2014). However, these infections may provide protection to certain allergies, *Schistosoma mansoni* infections may modulate the immune response against allergic and autoimmune diseases (Araujo et al. 2004). It has been shown that helminthic infections, through induction of regulatory mechanisms, are capable to modulate the inflammatory immune response involved in the pathology of autoimmune and allergic diseases (Araujo et al. 2004).

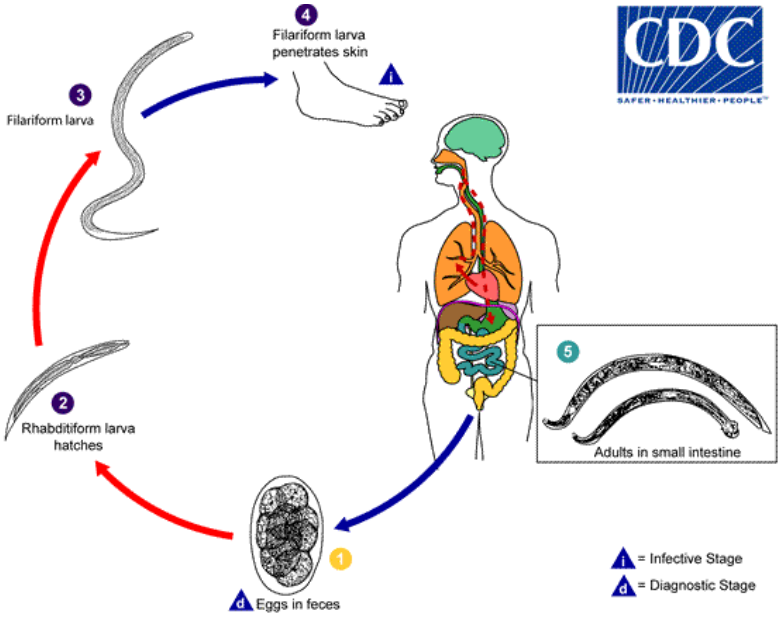


Figure 2. Life cycle of Ancylostoma duodenale

Image adapted from https://www.cdc.gov/parasites/hookworm/biology.html

The eggs pass into the stool (1), with favorable environmental conditions (moisture, warmth, and shade), the larvae hatch between 1 and 2 days. The rhabditiform free larvae mature in feces and/or on humid soil (2), after 5 to 10 days, become filariform (third stage) and infectious larvae. These infectious larvae can survive between 3 to 4 weeks under favorable environmental conditions. With direct contact of the human host, the larvae penetrate the skin and are transported by the blood vessels to the heart and to the lungs. They penetrate the pulmonary alveoli, rise to the bronchial tree towards the pharynx and are swallowed (4). The larvae reach the small intestine, where they live and become adults. The adult worms live in the light of the small intestine, where they attach to the intestinal wall and by suction they cause blood loss to the host (5). Most adult worms are eliminated within 1 to 2 years, but their lifespan can last several years.

Some *A. duodenale* larvae, following penetration of the host skin, can become dormant (in the intestine or muscle). In addition, infection by *A. duodenale* may probably also occur by the oral and trans-mammary route. *N. americanus*, however, requires a trans-pulmonary migration phase.

1.1.2 Schistosomiasis

Human schistosomiasis is a chronic disease caused by the tapeworms (trematodes) *Schistosoma mansoni*, *S. haematobium*, *S. japonicum* and *S. mekongi*. At least 243 million people are treated annually against schistosomiasis each year (WHO, 2013). The risk of infection is related to exposure to infested water during agricultural activities, games in stagnant waters, laundry in rivers, swimming in stagnant waters. Especially young children are at risk, by playing outside in poor hygiene conditions. The availability of clean drinking water, adequate sanitation and hygiene education

will help to reduce contact with infested water and contamination of water sources. The fight against schistosomiasis is focused on reducing morbidity through targeted and regular treatment with praziquantel. Hematuria is the presence of red blood cells in the urine (Figure 3). In clinic, hematuria may be a sign for infection, urinary tract stone disease or urinary tract cancer. But it is also the classic sign of urogenital schistosomiasis, caused by *S. haematobium*.

Figure 3. Normal urine samples and urine samples with hematuria collected from school children

1.1.3 Transmission and distribution of schistosomiasis

In *S. haematobium* infection, parasite eggs penetrate the bladder wall and are excreted in the urine. Hematuria, proteinuria, leukocyturia and symptoms like dysuria or nocturia are the most common clinical presentations. A study conducted in Nigeria on urogenital schistosomiasis in children to assess the burden of disease, and which evaluated efficient diagnosis of disease and morbidity in an endemic rural community found that schistosomiasis was highly endemic in the study area (Morenikeji et al. 2014). Furthermore, a similar study was carried out evaluating the prevalence, risk factors and clinical manifestations of schistosomiasis among school children in the White Nile river basin in Sudan. This study also found that the prevalence of schistosomiasis was high in this region and closely associated with the frequency of contact with dirt water, swimming or wading in streams (Ismail et al. 2014). A study in Zambia highlighted the high disease burden of *S. mansoni* in rural districts and called for immediate interventions to prevent complications associated with this disease (Mutengo et al. 2014).

WHO estimates that over 700 million people are at risk for schistosomiasis and over 207 million infected worldwide (WHO, 2010). The geographical distribution of schistosomiasis is extensive (Figure 4); it is estimated that one hundred million

people in Africa are affected by *S. haematobium* (WHO, 2010). The main endemic areas are the Nile Valley, tropical Africa, West Africa and South America. Schistosomiasis is also presents in some parts of North Africa, Madagascar and Mauritius. *S. mansoni* is widespread in Africa and Latin America while, *S. japonicum* is mainly present in Asia, such as China and in the Philippines (WHO, 2010).

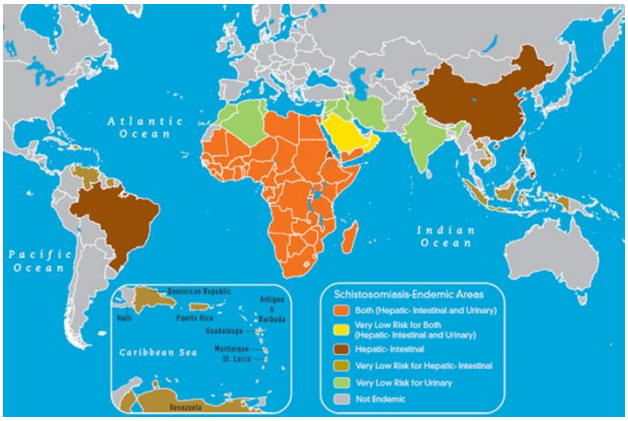


Figure 4. Distribution of Schistosomiasis
Image adapted from https://parasitophilia.blogspot.de/2012/12/
Red: *Schistosoma heamatobium*; Purple: *Schistosoma mansoni*; Blue: *Schistosoma mansoni* and *Schistosoma heamatobium*; Yellow: *Schistosoma japonicum*.

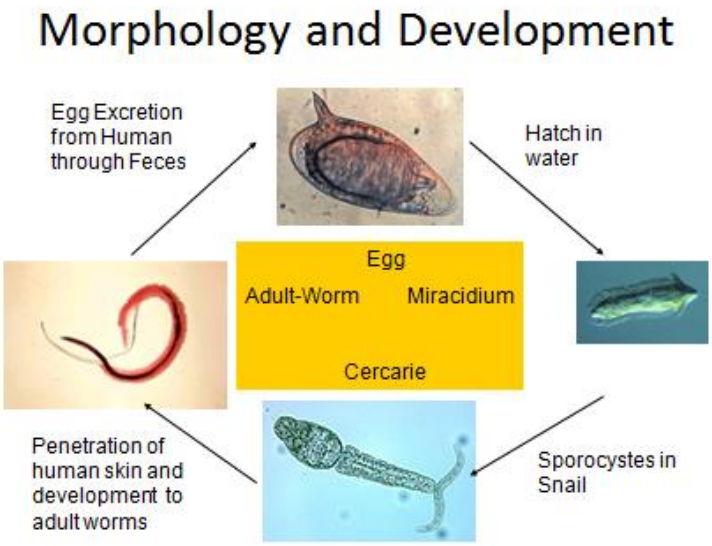


Figure 5. Description of *schistosoma hematobium's* morphology and the different stages its development

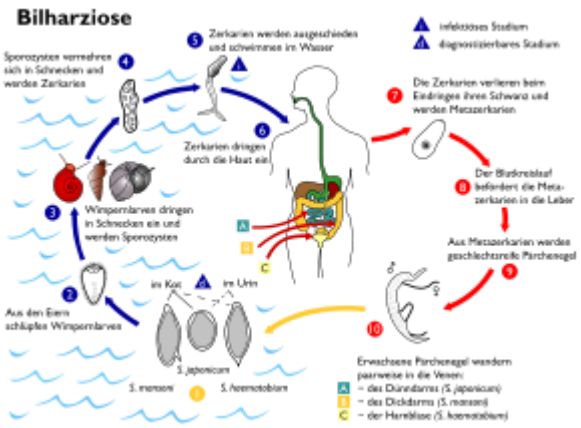


Figure 6. The life cycle of Schistosoma spp.
Image adapted from: https://www.cdc.gov/parasites/schistosomiasis/biology.html

First, adult worms in the egg excreted in the environment by urine and feces collapse in the first larval stage and infect the intermediate host, snail (HI) as described in figure 6. Then, maturation and sexual reproduction of the parasite occur in the intermediate host and lead to the second larval stage. Afterward, the parasite infects humans by penetrating the skin during their stay in contaminated waters and then migrate and maturate in to the final host Humans or animals. Mature schistosomes lodge in the capillary veins around the bladder or intestinal lobes undergo sexual reproduction resulting in the daily release of 300-3000 eggs over a 3-5 year lifetime of schistosomes

Human contact with water is thus necessary for infection by schistosomes. Various animals, such as dogs, cats, rodents, pigs, hourse and goats, serve as reservoirs for *S. japonicum*, and dogs for *S. mekongi*.

1.1.4 Parasite infections in children

Among parasite infections in children, soil transmitted helminthes (STH) (roundworm, hookworm, whipworm, and tapeworm) and vector borne diseases (schistosomiasis, malaria, filariasis, and trypanosomiasis) constitute a huge part and cause major morbidity in children. The main species that infect children are *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale* and *Necatora mericanus*. These infections lead to stunting; absenteeism and lack of performance and reduce work performance in school (WHO, 2014). It is estimated that worldwide nearly 270 million preschool children and more than 600 million school-age children live in areas where STH are transmitted intensively, and treatment and preventive interventions are urgently needed (WHO, 2014). Infections are widely distributed in tropical and subtropical areas with the largest numbers of infected children in Sub-Saharan Africa, the Americas, China and Southeast Asia (WHO, 2014).

Geo-helminthes and schistosomiases may affect nutritional status, and reduce intellectual capacities as well as cause tissue and organ damage or failure. Soil-transmitted helminthiases occur throughout developing countries and remain a major public health problem in the poorest communities with enormous

consequences on health and development of school-aged and pre-school children. Chronic infection may cause anemia that reduces the cognitive potential of school-children, retards growth and favors progression and manifestation of other illnesses (Matangila et al. 2014). School-age children of 5-15 years have a higher risk for acquiring parasitic infections and possess the highest parasite loads. These infections influence growth, vitamin A deficiency, disorders of attention, and impede learning and their cognitive development (Matangila et al. 2014). Adequate education is necessary to improve awareness and help to prevent diseases transmission. A study on malaria and schistosomiasis and soil transmitted helminthes burden showed that anemia reduces cognitive potential in school children, delays their growth and predisposed them to other diseases (Matangila et al. 2014). This study also found that *S. mansoni* infection and malaria were strongly-associated with high prevalences of anemia in school children. In another study, *S. japonicum* infection was treated using praziquantel to determine whether treatment of intestinal parasitic infections improves cognitive performance in school-aged children. This study showed that children cured of *S. japonicum* infection, and also those in whom STH species decreased, scored higher in cognitive tests than those without treatments (Ezeamama et al. 2012). Therefore, school-based interventions such as intermittent preventive treatment or de-worming by mass drug administration (MDA), prophylactic drug distribution and micronutrient supplementation are required to improve health in school-age children (Matangila et al. 2014), and such interventional studies have been carried out in Asia, Africa and other endemic areas such as in South America.

Research conducted in Malaysia studied the neglected factor influencing rural school participation of Aboriginal children and found that intestinal helminths infections still impact significantly the public health, mainly in the rural populations with negative consequence on the school attendance of children.Indeed a school based deworming program should be introduced and incorporated in the existing educational assistance targeting the aboriginal communities. (Ahmed et al. 2012). Study on the correlation of *S. mansoni* infection and cognitive functions of primary school children in Egypt demonstrated that children with infection have lower general IQ, poorer performance on comprehension and vocabulary than those without these infections (Nazel et al. 1999). It must be noted that other studies also evaluated parasitic infections and their consequences on the presence of children at school and on their school performance. Studies showed a significant decline in school performance and in attendance with increasing intensity of infection (Clercq et al. 1998, Ekanem et al. 1994). Similar work has been carried out on the prevalence and intensity of soil-transmitted helminthiasis and malaria and the nutritional status of children in Honduras, and this study showed that bi-annual deworming campaigns are necessary in regions where STH prevalence is >50% (Mejia et al, 2014). In Ethiopia, the prevalence of helminthes infections and gastrointestinal helminthes-associated risk factoring among school children were studied. This study showed that helminth infections are still a huge burden in school children and cause several advert influences. Therefore, proper intervention programs and environmental hygiene should be implemented for the prevention and control of helminth infections in those areas (Abera A. & Nibret E, 2014).

1.1.5 Interventions on neglected tropical diseases (NTD)

Research on helminth infections is mainly focused on drug distribution among populations especially addressing children with 0 to 5 years of age. Few studies were paying efforts on the relations between behavioral aspects, parasitic infection intensities and clinical manifestations of these diseases caused by parasites. Previous works have shown that infections with *Plasmodium spp*, *Trichomonas intestinalis*, *Entamoeba histolytica*, *S. mansoni* and *N. americanus* represent 86.5% of the parasite infections in Togo (Agbéré et al. 2001). Knowledge on diseases causes, hygiene issues and behavioral changes was not considered in these studies.

In Burkina Faso, several studies investigating parasitic infection were also carried out. The results show that a combined school and community strategy could be effective in reaching a large coverage of school-aged children in countries where enrollment is low and where primary schools cannot serve as exclusive anti helminthic drug distribution points (Gabrielli et al. 2006). Studies conducted in Asia (China, Japan, Thailand, India) showed the importance of drug treatment and its application, but the results indicated that education in health also has a great impact in the fight against parasite infections. Thus, school-based interventions are needed to fight against parasitic infections in school children, which may serve as a useful entry point for anti-helminthes activities as well as for hygiene and health education.

1.1.6 Health Education

The World Health Organization defined health education (http://www.definitions.net/definition/health%20education) as a "comprising of consciously constructed opportunities for learning involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills which are conducive to individual and community health" . Most of helminth infections studies were based on campaigns with mass drug distribution (Davis et al. 2014, (Chesnaye et al. 2011), and only few of them immersed in long-term interventions involving systematic deworming campaigns and educational measures (IEC).

Parasitic infections remain a public health problem in tropical regions, and it should be noted that very few studies were interested in education for behavior changing in these regions. IEC (Information Education Communication) remains one of the most effective ways for success in any behavior change in people. Health education can be defined as the principle by which individuals and groups of people, learn to behave in a manner conducive to the promotion, maintenance, or restoration of health. However, as there are multiple definitions of health, there are also multiple definitions of health education. The Joint Committee on Health Education and Promotion Terminology of 2001 defined Health Education as "any combination of planned learning experiences based on sound theories that provide individuals, groups, and communities the opportunity to acquire information and the skills needed to make quality health decisions" (http://www.definitions.net/definition/health%20education). For this domain, some studies have not only focused on fight against parasitic infections with mass drug administration, but

they have also considered various control measures. One study has been carried out to assess the impact of a mass drug administration on soil-transmitted helminthiasis (STH) control in Philippines; the findings showed that school-aged children in tropical developing countries carry a high burden of soil transmitted helminthes (STH) infections (Sanza et al. 2013). This study also pointed out the limitation of drug administration and showed that infections re-appeared 5 to 6 months after the drug distribution campaign. This observation led to the introduction of health education in schools to improve the knowledge in children and allow them to avoid parasite infections. The introduction of educational measures could improve health status in school children and reduced the rate of parasite infections among them in several endemic countries.

In this way, a study investigated the effects of post-deworming and health hygiene education actions on absenteeism in school-age children, and showed that students with moderate to heavy *Ascaris* infections and light hookworm infections even months after deworming missed more school days than uninfected children (Thériault et al. 2014).

In another study, schools were randomly given the health education package (intervention group) or health education poster (control group). Infection rates, knowledge about soil-transmitted helminthes, and hand-washing behavior were assessed before and after the intervention. The findings showed that the percentage of children who washed their hands after using toilet was nearly twice than in the control group, and the incidence of infection with soil-transmitted helminthes was 50% lower in the intervention group than in the control group (Bieri et al. 2013).

Information, education and communication (IEC) is a set of approaches or materials for transmitting information, in order to achieve a change of behavior. The intention is to guide people throughout their educational studies and to enable behavioral change. Communication in IEC is planned and designed to encourage individuals to adopt new behavioral processes. It has been shown that health education programs should focus on improving hygienic behavior and that they should use schools as channel for communicating with children (Curtale et al. 1998). These activities have been developed and used as a mean to promote desired and positive behaviors in communities. Materials such as posters, flyers, leaflets, brochures and booklets for health education sessions as well as radio broadcast or TV spots, etc. are used in IEC sessions. These initiatives are commonly referred to as “information, education and communication (IEC)” activities.

An operational definition of “IEC” refers to a public health approach aiming at changing or re-inforcing health-related behaviors in a target audience, concerning a specific problem and within a pre-defined period of time, through communication methods and principles; a definition adapted from “information, education and communication – Lessons from the past; with perspectives for the future”. This definition helps to emphasize the need for IEC initiatives which:

- have a clear objective (the specific behavior to change or reinforce);
- target a specific audience (e.g., school children, mothers of children below five years old);

- address a “specific problem” (e.g., Hygiene and school health problems), rather than attempt to change many problems at the same time;
- set a timeframe within which the results, (“change in behavior”) are expected to occur.

The problem must be well defined, as what the IEC interventions aim to address. Thorough understanding of what people do, what prevents them from following the desired practices (“barriers”) and what facilitates them (“enabling factors”) is essential before designing a communication intervention. It is obvious that this requires a detailed plan, the implementation which needs to be monitored closely according to pre-set indicators, and then properly evaluated.

Activities following these principles and meeting the above definition can be considered IEC initiatives, with a higher potential to achieve the stated objective than the others. Thus, for example, the development of a poster without the following elements would not be a structured IEC initiative: audience analysis; testing; a plan with objectives, indicators and targets; a clear target audience; a distribution plan with follow-up; regular feedback through monitoring; and a formal evaluation.
The advantage of a public health thinking in this way is to be outcome-oriented, use resources more efficiently and learn important lessons for the future from this experience.
Studies have been done on the efficiency of the communication and education program in health for the control of *Schistosoma mansoni* infection in Bahia/Brazil. Activities on information, education, communication and community mobilization (IEC/MC) were introduced. This research assessed the epidemiological effect of IEC/MC, with a quasi-experimental study design strategy, by associating *S. mansoni* infection’s prevalence in IEC/MC study group and other groups. A decline on the prevalence of *S. mansoni* infection was seen in all study areas, especially in those with IEC/MC activities, which shows that IEC activities are effective for school-age children (Santana et al. 1997). In general, it is important to aim school children to better control parasitic diseases. School-aged children are still growing and learning, easy educable and, most importantly, they are expected to have the highest parasite load. Nevertheless, preventive chemotherapy targeting school-aged children has its limitations, as older population groups are neglected leading to a lack of knowledge about how to prevent and control parasitic worm infections. Improved access to clean water and sanitation is necessary; along with health education; it will make a durable impact on helminthes infections. Questionnaires based on these strategies may help to better control knowledge on parasitic infections. Indeed, parasitological analysis will give an overview of the prevalence situation and set up an appropriate control measures.

1.1.7 Neglected Tropical Diseases in Togo

NTDs are infections encountered in tropical or subtropical regions. They mainly affect the poorest populations living in remote rural areas, in slums or in conflict regions. They are favored by the lack of safe water, poor housing conditions and lack of sanitation. Children are the most vulnerable to these diseases, which each year kill, disable or irreparably invalidate millions of people.

Nearly 17 infections are classified by the World Health Organization (WHO) as NTDs (https://en.wikipedia.org/wiki/Neglected_tropical_diseases). In Togo ten out of them are endemic - these include lymphatic filariasis, onchocerciasis, geo-helminthiasis (ascaridiasis, hookworm infection, and trichocephalosis), schistosomiasis, trachoma, guinea worm, buruli ulcer, leprosy, yaws and trypanosomiasis. In 2006, the NGOs (Non-Governmental Organizations) in Togo, the West African Centre for International Parasite Control (WACIPAC) and the WHO found that the burden of disease is a real obstacles for the country's development. The prevalence of parasite infections in children remains at a high levels even after de-worming with albendazole, and most children are poly-parasitized (with at least two parasites/child), typically with amoeba, giardia and trichomonas infections (Agbéré et al. 1995).

II. THE RATIONAL OF THE STUDY

Neglected tropical diseases (NTDs) are a diverse group of tropical infections which are especially common in low-income populations in developing regions of Africa, Asia, and the Americas. These chronic infectious diseases are encountered in rural and urban areas or in conflict zones where low-income populations are living. They include roundworms (ascariasis), whipworms (trichuriasis), hookworms (necatoriasis, ancylostomiasis) (schistosomiasis), elephantiasis (lymphatic filariasis), trachoma, leishmaniasis, Chagas disease (American trypanosomiasis), leprosy, sleeping sickness (African trypanosomiasis), guinea worm (dracunculiasis), and buruli ulcer. In some cases, the treatments are relatively inexpensive. However, preventative measures are often more accessible in developed countries, but they are not universally available in developing countries. In poorest societies the burdens of neglected tropical diseases are often overshadowed by other public health issues. It is estimated that the world burden of NTDs is as high as the rate of malaria or tuberculosis and even higher (Hotez & Kamath, 2009). They cause about 500 000 to 1 million deaths each year, and therefore, NTDs became a great health problem for these countries (WHO, 2011). Integrated control programs on NTDs in Africa have adapted experiences made by approaches to control human helminth infections, notably the integrated rapid mapping approach targeting multiple neglected tropical diseases simultaneously (Brooker et al. 2009). NTDs are also a group which includes several less known chronic infections that predominantly affect health of children in poor and disenfranchised communities. In addition, many people in these regions are poly-parasitized (having more than one infection). There are three major soil transmitted helminthes (STH) infections (ascariasis, hookworm and trichuriasis), which together with schistosomiasis and trachomiasis, cause significant morbidity in children. These NTDs, together with lymphatic filariasis and onchocerciasis, are targeted by the global control and elimination programs through mass drug administration (MDA) campaigns (Barry et al. 2013). Several NTDs, especially schistosomiasis, geo-helminthiases, and filariasis can be easily controlled by regular preventive therapy (WHO, 2008). A study on parasite infections in the adult population showed that hookworm and schistosomiasis were dominant in adults, and if left untreated, they could remain important potential reservoirs and could induce

re-infection in treated school-age children. Therefore, innovative strategies are necessary (Njenga et al. 2011).

Relying on school infrastructure to distribute de-worming drugs is one of the easiest ways to treat a large number of school-age children, which made school-based control program one of the cornerstones for fighting NTDs. Intestinal parasitic infections are the most common diseases in Sub Saharan Africa and pose a major public health problem in this area. They are permanent threats for socio-economic development in developing countries and cause high morbidity and mortality. More than a billion people suffer from one or more neglected tropical diseases. Poverty increases the presence and spread of these diseases, which intensify and maintain the poverty of the affected communities (WHO 2010). Previous studies on the risks and threats of parasites have shown that these emergent or re-emerging diseases are extremely worrisome as their diagnosis and their prevention are often difficult. The determination of the specific and vital biologic processes of these microorganisms could allow defining the most appropriated targets and the most effective means to control these pathogens (Pinel et al. 2002). Consequently, these infections will lead to the development and emergence of several other diseases, which may require enormous expenses for therapeutic treatment and preventive measures, can have a huge impact on public health as well as on economic losses. Compared to other lethal diseases such as AIDS and malaria, intestinal parasites have received less attention and thrive under favorable weather conditions, lack or insufficiency of hygiene and sanitation as well as poverty. These factors also favor the socioeconomic instability that disrupts local health systems, drug costs and distribution as well as the monitoring of treatment.

The present study on hygiene and school health in the central region of Togo has been chosen following certain observations that were found in some primary schools of this region. Most schools had serious problems of insalubrity with garbage that streams school environment, classrooms were often poorly maintained and in some rural schools children were even seated directly on the floor. It may also be noted that most of schools do not have latrines or, in case they exist, they are often in poor condition. Some of the schools involved in this study were also located near seasonal rivers which constituted children's playgrounds and recreation areas. At the beginning of this study, it was found that school children’s knowledge on parasitic diseases was low and parasitological surveys showed that the prevalence of hookworm infection was high (59.34%, n=755) and similarly for schistosomiasis (37.95%, n=672). This required long-term interventions in order to reduce the parasitic burden in those children, and the application of mass treatment with Albendazole to all students required more than 13,000 treatments per year, and treatment of schitosomiasis applied with Praziquantel required more than 2,000 tablets per year in these schools. After several years of intervention, the prevalence of hookworm infection lessened to 25.4% and for urinary schistosomiasis it was 10.8%. These prevalence were still high after de-worming, however, parasitic loads have decreased considerably compared to the first years of intervention. Furthermore, children were often poly-parasitzed, and initially 12.4% of school children had both hookworms and schistosomiasis. *Schistosoma haematobium* infection affected large part of schools in which prevalence varies between 0% and 34%. *Ankylostoma duodenale* infections also varied between 7% and 46%. Therefore, health and school

hygiene issues taught by IEC in schools, could change behavior in school children as in their peers and within families.

The present study is focused on school age children because childhood is considered to the best period for learning hygienic behavior, and the subjects children learn have chance of being assimilated and applied in their direct environment. Primary school are also considered as a good environment for message transmission and for education of behavioral changes in children. As sanitary facilities are available in some schools, those could be used for demonstrations of their appropriate uses to school children and it will enable them to take care after their own health.

On the scientific and pedagogical level, this study allowed school children to learn and understand why they must adopt appropriate attitudes regarding hygiene and the necessity to maintain their schools clean and healthy.

IEC may help to develop good hygiene practices in children both at school as well as at home and will enable them to better understand the various parasitic diseases, their prevention and treatment methods. This study as part of school health education, may help to answer some specific aspects related with hygiene and questions about parasite infections in school children. This scientific work may also identify yet unforeseen problems that emerge and its resolution could allow a better management of parasite infections in school children, notably, on the timing and periodicity of the IEC courses, the selective drug application and treatments.

In Togo, intestinal parasite infections are still a major public health problem. According to the annual report from the Ministry of Health (Rapport annuel Ministère de la Santé M/S 2014) in the central region of Togo, intestinal parasites constitute the fourth leading cause of morbidity (5,8%) after malaria (60,4%), respiratory tract acute infections (7,2%), wounds and injuries (5,9%).

FIRST TEN CAUSES OF MORBIDITY IN THE CENTRAL REGION OF TOGO				
Period: ANNUAL REPORT			YEAR	2014
REGION CENTRALE				
N°	WHO Code	DISEASES AND SYMPTOMS	FREQUENCIES	%OF TOTAL
1	84,0	Malaria	231 668	60,4%
2	465,0	I.A.V.R.I (Acute Respiratory Infections)	27 471	7,2%
3	879,0	Wounds and trauma	22 568	5,9%
4	129,0	Intestinal parasites	22 152	5,8%
5	285,0	Anemia, unspecified	8 431	2,2%
6	401,0	High Blood Pressure	8 021	2,1%
7	9,1	Gastroenteritis	7 573	2,0%
8	709,0	Dermatoses	6 890	1,8%
9	729,0	Unspecified rheumatism	3 498	0,9%
10	372,0	Conjunctivitis	3 209	0,8%
		TOTAL	341 481	89,0%
	TOTAL REGISTERED CONSULTANTS		383 763	100,0%

Table 1. The 10 main causes of morbidity in the central region of Togo are shown for the year 2014. Data are adapted in part and modified from the 2014 Annual Health Report (Direction Regional de la Santé Region Centrale/Togo (DRS-RC)).

In the central region of Togo about 22,152 people consulted in 2014 for infections related to intestinal parasites. Nevertheless, the Togolese government in partnership with World Health Organization (WHO) and United Nations Children's Fund (UNICEF) has made considerable efforts in fighting against these intestinal parasites in children through regular deworming campaigns organized since years.

III. AIMS AND OBJECTIVES OF STUDY

3.1 Objectives of the current work

The high prevalence of parasite infections and the wide distribution of various parasites in children living in tropic regions remains a major concern, and most control activities focused on drug-supported de-worming campaigns. The global strategy for the control of soil-transmitted helminthiasis is based on regular anthelminthic treatment. Health education, sanitation, personal hygiene and other means of prevention remain still not well developed, and only few studies have investigated the impact of information education and communication on parasite infections in school children. In Togo, especially in the Central Region, soil-transmitted helminth (STH) diseases are frequent and notably high in school-age children. It remains to analyze in depth the different characteristics of parasite infections in the population of the Central Region, and especially for school children to find out how to contribute to an effective fight against these parasites.

The present study was a longitudinal study in public primary schools (EPP) in the Central Region of Togo (Figure 8). The study was carried out in 24 study semi urban and rural public primary schools in Sokodé and in 82 control public primary schools in the Central Region of Togo.

This study concerned school-age children aged 5-15 years. The parasitological status was assessed with stool and urine samples examinations. After each parasitological analysis, de-worming campaigns were organized which primarily focused on pupils being parasite infection positive, and at the same time, a de-worming was organized for the entire schools, including teachers. A questionnaire based on the knowledge of children about hygiene and school health was applied, to assess the impact of information, education and communication (IEC) activities on health and hygiene behaviors. This questionnaire allowed to measure the level of knowledge of school children on the various parasite infections and diseases which are endemic in this region. The questionnaire is based on 35 questions on: Knowledge on the various parasitic diseases, their causes, symptoms and prevention, knowledge on aspects related to vaccination, HIV and food hygiene knowledge on the causes and symptoms of various parasitic diseases and on absenteeism from school.

The present work was conducted by disposing educational materials in the public primary schools to enable pupils to acquire notions on good practices in the field of hygiene and health. Furthermore, to educate how to adopt disease preventive

behaviors, how to respond to health problems, and especially how to improve environmental and school hygiene. Overall, this prospective and longitudinal research aimed to investigate the impact of information, education and communication in school-age children living in an environment endemic for numerous parasite infections. This long-term evaluation with school-based IEC activities comprises a comprehensive strategy for prevention of parasite infections and the reduction of infection intensities.

The main and general objective of study are:

(1) to identify and reduce the burden of parasitic infections notably intestinal worms and schistosomiasis, **(2)** to strengthen the capacity of school children aged from 5 to 15 years to take in charge their own health, and **(3)** through IEC courses to improve the physical environment in the selected primary schools.

Specific objectives are:

1. Conduct a systematic parasitological surveys to assess the prevalence and the intensity of the parasite infections in the selected primary schools.

2. Improve school children knowledge on hygiene and school health as well as on parasitic infections transmission in the selected primary schools.

3. Apply parasitic treatments against intestinal worms and schistosomiasis to school children in the selected schools.

IV. MATERIALS, STUDY GROUPS AND METHODS

4. Material and Methods

4.1 Study Sites

The Republic of Togo (République Togolaise) is a country in West Africa bordered by Ghana to the west, Benin to the east and Burkina Faso to the north. It extends south to the Gulf of Guinea, where its capital Lomé is located. Togo covers 57,000 square kilometers (22,008 square miles) making it one of the smallest countries in Africa, with a population of approximately 7.5 million. From the 11th to the 16th century, various tribes entered the region from all directions. From the 16th century to the 18th century, the coastal region was a major trading center for Europeans to search for slaves, earning Togo and the surrounding region the name "The Slave Coast". In 1884, Germany declared Togoland a protectorate. After World War I, rule over Togo was transferred to France. Togo gained its independence from France in 1960. The average population density is 72 people per km², with variations ranging from 299 inhabitants/km² in the Maritime region, 27 inhabitants/km² in the central region.

4.2 Geographical features.

Togo is a tropical, sub-Saharan country, it has some rugged terrain and a subtropical climate. The country is divided into five main economic and administrative regions, which are from north to south: the Savanna Region, the Region of KARA, the CENTRAL Region, PLATEAUX Region MARITIME Region. Each economic region is divided into prefectures (Districts). The country has thirty five prefectures and sub-prefectures whose capitals are treated as urban centers.

Togo is highly dependent on agriculture, with subtropical climate that provides good growing seasons. The official language is French but many other languages are spoken in Togo.

4.3 The Central Region of Togo

This study took place in the Central Region of Togo (Figure 7) in the districts of Tchaoudjo, Tchamba, Sotouboua, Blitta and Est-Mono. All these districts are neighboring and have a semi-humid tropical climate with two seasons with a dry season and a rainy season. Surface water is drained by a net of rivers and seasonal rivers, the most important are: Mono, Anié the Mô, and Aou. The Central Region occupies a central position in the country (hence the name of Central Region) and at 300 kilometers north of the capital Lomé. The Central Region of Togo is one of the six health regions in Togo; it covers an area of 13,317 km2. It is limited on the north by the Kara Region, in the south by the Plateau Region, at east by the Republic of Benin and to the west by the Republic of Ghana.

Figure 7. Map of the Republic of Togo
Image adapted from: http://www.diplomatie.gouv.fr/fr/conseils-aux-voyageurs/conseils-par-pays/togo/. Map of the Republic of Togo. The countries bordering Togo to the north are Burkina Faso, to the south the Atlantic Ocean (Gulf of Guinea), to the east Benin and west Ghana. The political map with the different districts or prefectures (35 Prefectures and 5 Regions). Sokodé (Prefecture Tchaoudjo), the capital of the Central Region, is situated in the center of Togo.

The main economic activities are agriculture (millet, maize, beans, yam, rice and cotton), trade and craftsmanship that is growing. There is no industry. The informal sector is developed with a mainly young workforce.

The central region is one of the most populated regions of Togo with a very representative ethnic diversity. All Togolese ethnic groups are represented in this region with a predominance of Tem-Cotokoli, Kabyè, Losso, Tchamba and Adélé-Agnanga. The population density is about 37 people per km2. It has an estimated population of 618.000 people according to a census done in 2010 with a high concentration in the prefecture of Tchaoudjo (34%), which represents 20% of the total area. Per capita income in the region is close to the national average is 310 USD according to UNICEF. In Togo, according to the MICS 2011 (Multiple Indicator Cluster

Surveys) survey, illiteracy affects about 43.3% of young people and adults aged between 15 and 44, ie 977 000 people, of whom more than two-thirds are women (670 000). This overall rate is also characterized by strong regional disparities. Indeed, the illiteracy rate varies considerably from the southern region of the country to the northern region and is reflected in a very wide gap ranging from 18.5% for Lomé (the capital) to 67.2% for the Savannah region. Out of Lomé and Maritime Region (33.4%), the illiteracy rates of the other regions are all above the national average: Trays 44.7%, Central 42.2% and Kara 45.9%.

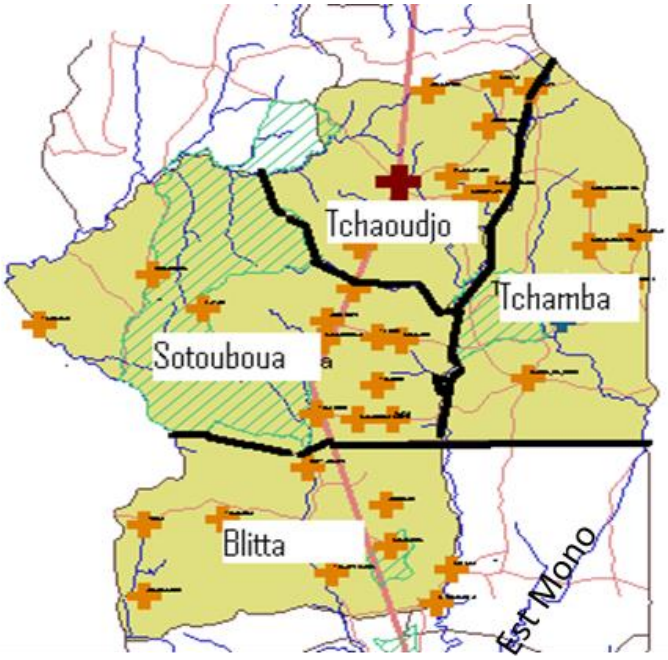


Figure 8. Map of the Central Region of Togo. The region is composed by the Prefectures of Tchamba, Blitta, Sotouboua and Tchaoudjo. The Capital of this region is Sokodé.

4.4 Health situation

The infant mortality rate in Togo is approximately 50 deaths per 1,000 children in 2012. Male life expectancy at birth was at 60.6 in 2012, whereas it was at 65.8 for females. There were 4 physicians per 100,000 people in the early 2000s. As of 2010, the maternal mortality rate per 100,000 births for Togo is 350, compared with 447.1 in 2008 and 539.7 in 1990. The under 5 mortality rate, per 1,000 births is 100 and the neonatal mortality as a percentage of under 5's mortality is 32. In Togo the number of midwives per 1,000 live births is 2 and the lifetime risk of death for pregnant women is 1 in 67.

4.5. Health system in Togo

Togo is divided from south to north in six health regions:

• Lomé Commune, Maritime region, Plateau region, Central region, Kara region, Savanna region.

These regions are further divided into districts. There are currently 40 health districts.

The health care's organization is pyramidal with three levels that are from bottom to top:

• The prefectural or health district level is represented by the 4 Prefectural Hospital centers, 40 district hospitals, 571 peripheral care units of public and 356 private care units.

• The intermediate or regional level with 6 regional health directorates (DRS) is represented in each health region by the Regional Hospital Centre (CHR). The top of the pyramid is the central level comprises the Ministry of Health, the General Directorate of Health and its central directorates, departments and services, 3 university hospitals (3 CHU), a National Institute of Hygiene (INH), and a National Blood Transfusion Centre.

4.6 Heath situation in children

Intestinal parasitic infections are the most common diseases in sub-tropical regions and constitute a serious public health problem and a continuing threat to socio-economic development in developing countries. Morbidity and mortality remain very high due to these diseases. Their consequences are huge especially in children and pregnant women. Intestinal parasites occupy a prominent place.

In Togo, 83,600 people consult each year due to diseases related to intestinal parasites according to the report of the ministry of health in 2010. These intestinal parasites raise nowadays little interest compared to more serious diseases such as AIDS, tuberculosis. Intestinal parasitic infections in the tropics are a public health problem, due to favorable weather conditions for their development, the absence or lack of hygiene and sanitation measures and finally poverty within the population. To these many factors favoring the development of these diseases join the socio-economic instability that disrupts the health system, drug costs and difficulties of distribution and monitoring of treatment. But note that the Togolese state in partnership with WHO and UNICEF has made efforts in the fight against these intestinal parasites through the many deworming campaigns organized since years for children aged 0-5 years.

Despite these efforts, there is a persistent intestinal parasite infections in urban, peri-urban and rural areas in Sokodé and within the Central Region. Indeed, their intensity and prevalence are especially high in rural and peri-urban children; they often lead to malnutrition, anemia, increase in mortality and decrease school attendance.

To fight against intestinal parasites infections in children, it is important to know the situation in each area (have clear awareness about the prevalence, the parasite load in children) and knowledge-attitude-practice of populations facing these intestinal parasites infections.

Our investigations to undertake this study has proved that parasitic infections were highly prevalent. Children are often poly parasitized notably with amoeba, giardia and trichomonas, hookworms and others in the study zone. Infection with hookworm *Schistosoma haematobium* affects a large proportion of schools. It has also been found that students' knowledge on parasitic diseases was very low, this had led to the

introduction of the IEC program to enhance the knowledge of school children on the mode of transmission and prevention of these parasites infections to limit reinfection.

4.7 Study design

Sites selection criterions

The present research took place in selected public primary schools (EPP) in the Central Region of Togo. The laboratory diagnoses were performed at CHR (Centre Hospitalier Régional) and the ORL in Sokodé where parasitological examinations and data analyses have been completed.

The schools selection criteria were according the presence of intestinal parasite infections and to the geographical location. The EPPs were often bordering or near poorly sanitized rivers where children used to play. Poorly drained rivers often cross quarters, villages, cities and regions. The present study identified public primary schools in Sokodé and the surrounding Prefecture Tchaoudjo. These EPPs were selected for parasitological surveys, systematic de-worming and for IEC sessions on health and school hygiene. These schools were chosen because of prevalence of schistosomiasis and hookworms infections and various only basic hygiene measures and infrastructures. The EPP were often without drinking water and electricity supply. EPP Nada Fig. 9, is one of the schools where the school children infection rate is often high, and this EPP is located not far from the river named Kpondjo where children often go swimming. In Fig. 10 and Fig. 11 the EPP Damala and EPP Tchoubong are shown; two EPP in rural areas where the schools were built like huts. The class rooms were not cemented without benches, children were seated directly on the floor or on pieces of cut wood in the shape of stools. Here, drinking water and electricity were lacking.

Overall, the present study has considered about 3100 children from Sokodé and surrounding central region of Togo.

Figure 9. Public Primary School (EPP) Nada (Tchaoudjo District) in a peri-urban area of Sokodé.

Figure 10. Public Primary School (EPP) Damala (District of Tchaoudjo) situated in a rural area.

Figure 11. School children in front of EPP Tchoubong (District of Tchaoudjo) situated in a rural area

4.8 Study samples

Study group characterization

The present study was based on activities initiated in the context of an applied field research project on "Health and Hygiene School" which was mainly aimed to evaluate and to strengthen the capacity of school children aged 5-15 years to take in charge their own health and such to improve their school performance, and their school physical environment.

For this purpose, in total 106 schools in the Central Region (Tchaoudjo, Tchamba and Blitta) and in East Mono were selected in urban, semi-urban rural areas of the central region of Togo. The selection criterion of schools is based on the prevalence of parasite infections and on the school children knowledge about parasitic diseases.

Concerned Districts in the Central Region of Togo	Number of schools (EPP) per District
Tchaoudjo	38
Tchamba	18
Sotouboua	18
Blitta	16
Est-Mono	16
Total	106

Table 2. Distribution of surveyed schools (EPP) per district

In this region, most schools had serious problems of insalubrity with garbage that streams school environment, the classrooms are often poorly maintained and in some rural schools children were even seated directly on the floor.
In each school, the selected students for parasitological examinations and for the questionnaire were chosen in the levels of "Cours Moyen", (CM, 5th and 6th class of the primary course) and in the "Cours Elementaires" (CE, 3rd and 4th classes of the primary course). Students were drawn at random to constitute a sample of 30 school children in each school, for questionnaire and parasitological stool and urine analysis. The distribution of students by sex for EPP-IEC3 and EPP-Plan1 is shown in figure 12. It appears a slight dominance of the number of boys compared to girls, even if the sample was balanced from its composition. For all these schools, children were aged from 05 to 15 years. The mean age of the children selected for this study was 11 years in EPP-IEC study group and 10 years in the EPP-Plan1 control group as shown in Figure 13.

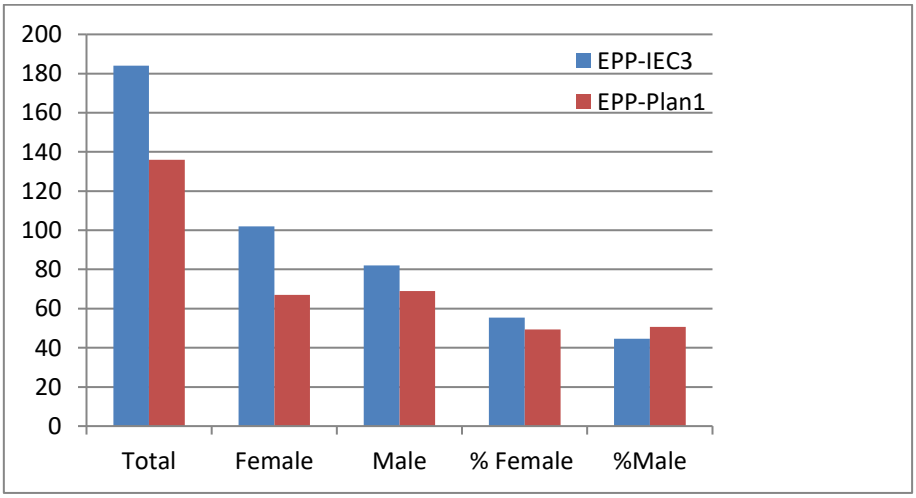


Figure 12. Distribution of students by sex in the different groups

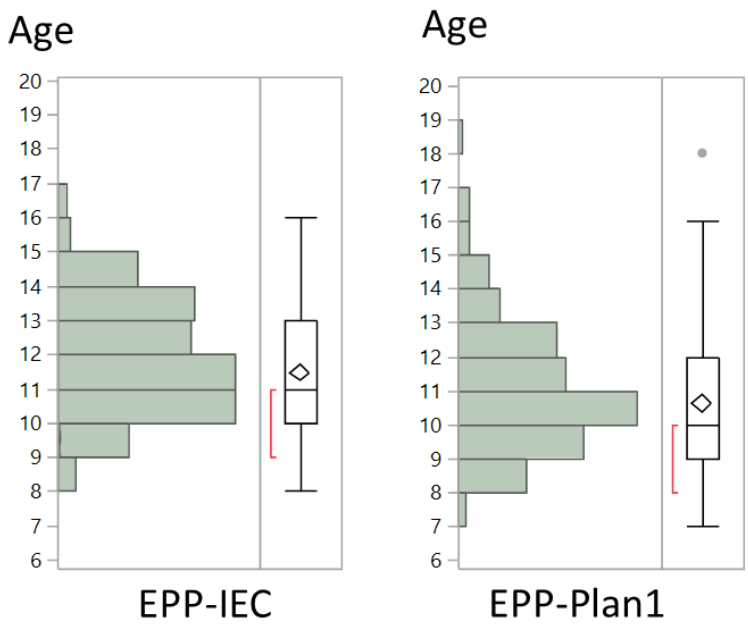


Figure 13. Distribution of students by age in the different groups

The present study was conducted in two groups: the study group (EPP-IEC) and a control group (EPP-Plan1). The EPP-IEC group consists of schools located in semi-urban and in rural areas. This group is divided into 3 subgroups according to the number of years of intervention with the IEC health and hygiene programs: EPP-IEC (n=821): EPP-IEC1 group (n=219), EPP-IEC2 group (n=184), EPP-IEC3 group (n=418)). Note that EPP-IEC group received IEC repeatedly and parasitological diagnosis, anti-helminthes treatments and IEC sessions annually since the beginning of the study.

Regarding the control group (EPP-Plan1 group (n=2321)), here the schools were also located in semi-urban and rural areas and share practically the same socio-demographic criteria as those of the EPP-IEC group. The difference between these two groups is that in the EPP-Plan1 schools, the repeatedly parasitological diagnosis, anti-helminthes treatments and IEC sessions were not applied for this group.

4.9 Interventions

Intervention Programs

For the present study, an interventional program has been elaborated for the selected schools in Central Region of Togo. The activities focused first on training teachers on aspects and problem of health and school hygiene. Teachers will be responsible for the transfer of notions and IEC to their students. The subjects taught to school children were developed and are presented on instructive posters whose content aims to improve children knowledge and wellbeing. The posters were developed to strengthen knowledge on parasite infections, how to prevent diseases, how to recognize and cure diseases linked to the lack of hygiene and false comportment. The diseases taught include malaria, intestinal parasites and urinary schistosomiasis, AIDS, tuberculosis, and diarrheal diseases, those being present in the Central Region of Togo and especially in the schools (EPP) selected for the present works.

An IEC (information education communication) program and courses were introduced to each EPP, adapted to the hygiene situation and focused according to the prevalent parasite infections in the study area. Systematic deworming was undertaken in collaboration with local health institutions in the selected schools. The design of these educational IEC documents has been completed in collaboration with a team from the Regional Directorate of Health (DRS) and the Prefectural Health Directorate (DPS) and Onchocerciasis Reference Laboratory (ORL).

The Education Manual

The manual was prepared to make available to teachers and students educational materials which enable them to acquire notions for good practices in the field of health, and to guide them to adopt appropriate behaviors which will allow to deal with health problems and especially to improve hygiene in their environments. The education manual notably contains health-education packages to prevent intestinal helminths infections.

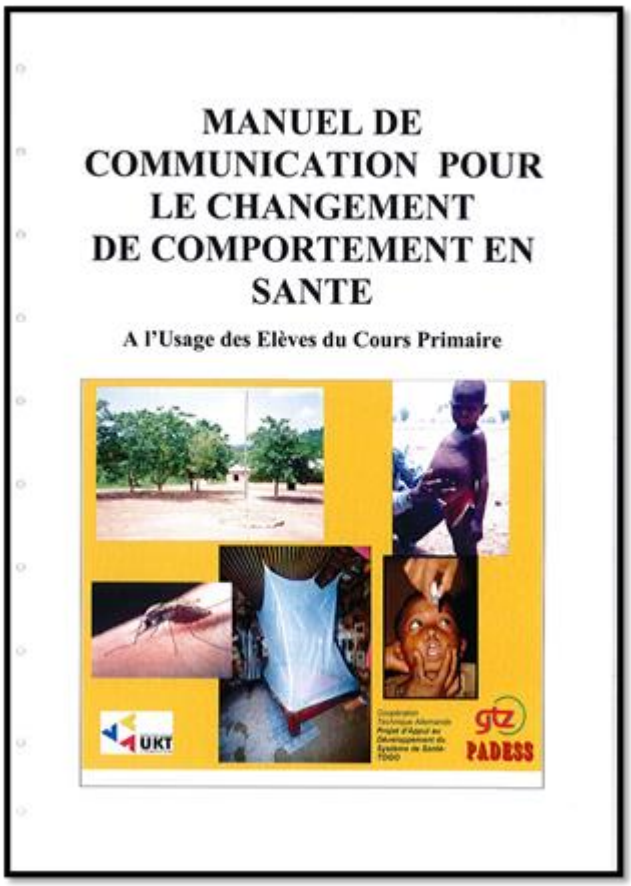


Figure 14. Health Behavior Change Communication Manual.
Document developed and provided to primary school's teachers

Information Education Communication (IEC) courses

Information Education Communication (IEC) sessions were first delivered to school teachers concerned on poverty-related diseases such as malaria parasite infections, AIDS, tuberculosis, diarrheal diseases etc. Laboratory technicians were responsible for delivering these courses under the supervision of health psychologists who were responsible for sensitizing the ideal behavior change needed to strengthen deworming

and parasitological monitoring activities carried out in the field (schools) by Laboratory technicians.
Regarding the transmission of knowledge on hygiene and school health to pupils, each trained teacher was responsible for taking these courses to his school children. It should be noted that the first sessions of these courses to students were made in presence of trainers (laboratory technicians and Health psychologists) responsible for supervising teachers.
The developed educational manuals were presented as books containing themes and topics related to health and school hygiene and considered to be necessary for school children's education in this field. For each topic, a sequence of pictures are presented; these pictures describe different diseases contained of the IEC program. Motivational questions were developed for each subject and correct answers were proposed for each. Educational posters and manuals for IEC program are complementary. They strengthen and facilitate teachers and school children understanding for the different subjects.

Education materials

The Manual of IEC and CCC

Educational manuals are presented as books developing topics related to hygiene and health in schools and considered as necessary for schoolchildren's education. For each topic, series of pictures are presented; theses series describes different diseases, its causes and its prevention and its cure procedures.

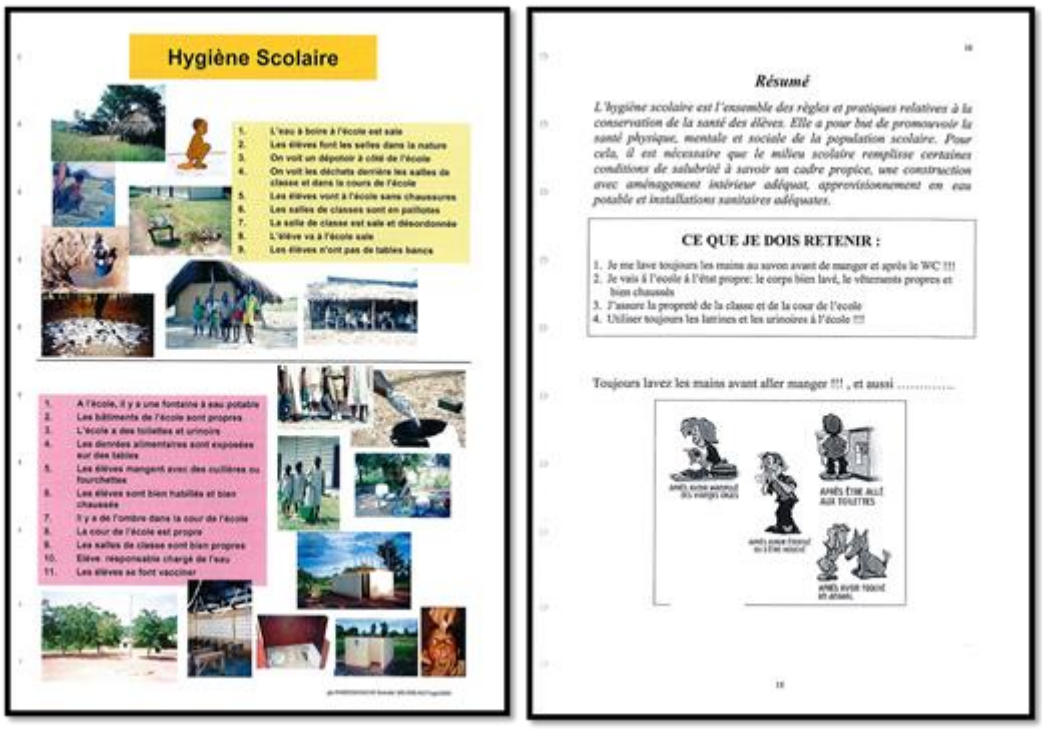


Figure 15. Teaching method for behavior change in Hygiene in primary schools

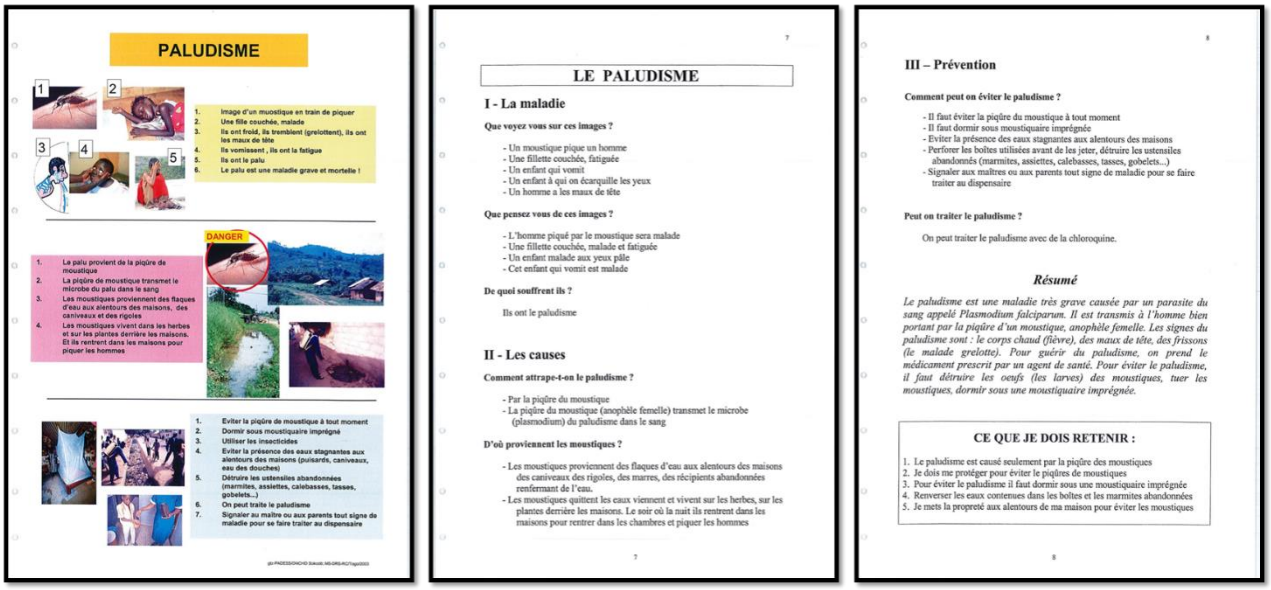


Figure 16. Teaching method in the education manual on Malaria (disease, causes, prevention) in primary schools

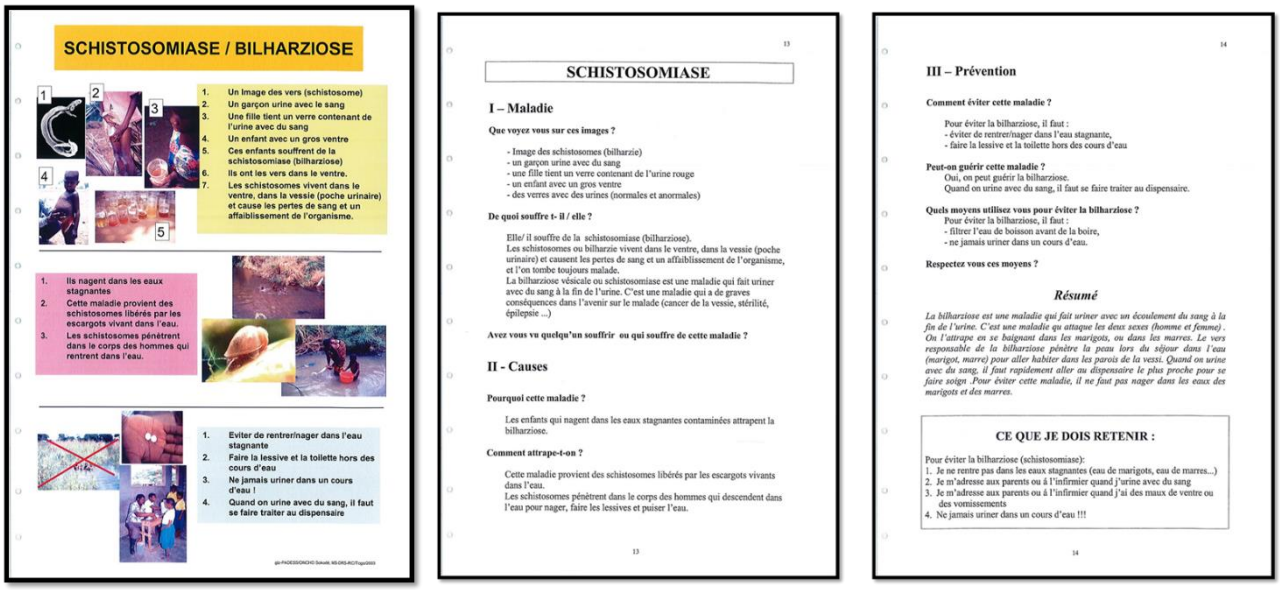


Figure 17. Teaching method in the education manual on schistosomiasis (disease, causes, prevention) in primary schools

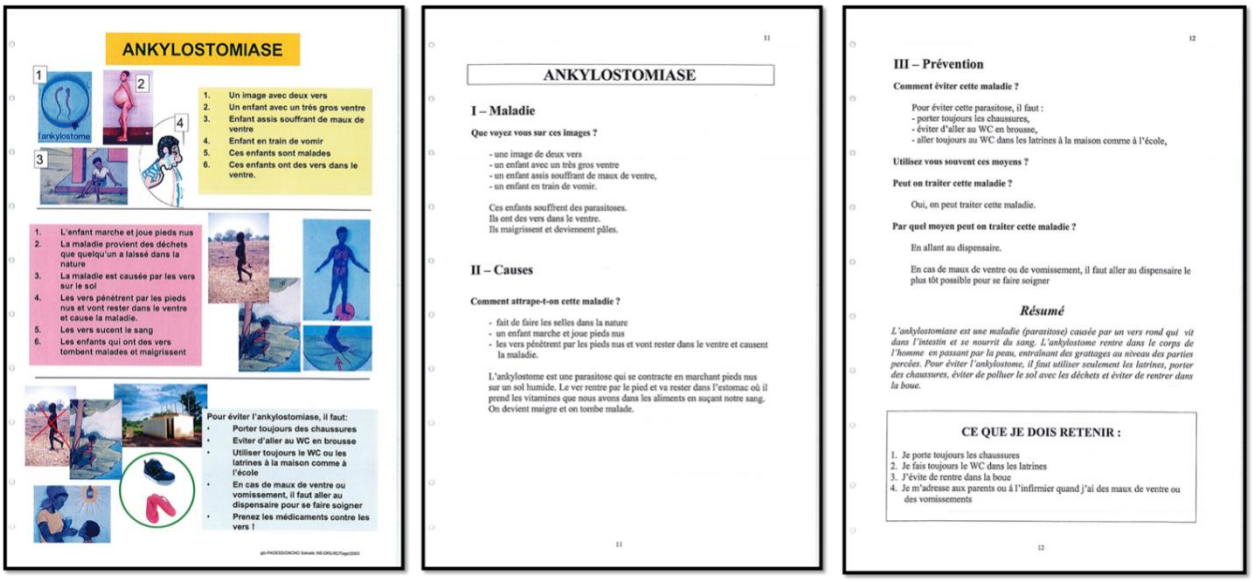


Figure 18. Teaching method in the education manual on hookworm (disease, causes, prevention) in primary schools

Stimulation questions are developed for each subject and also proposed answers for each picture.

Educational Posters and educational Manuals IEC/CCC are complementary and they strengthen and facilitate the understanding for the user.

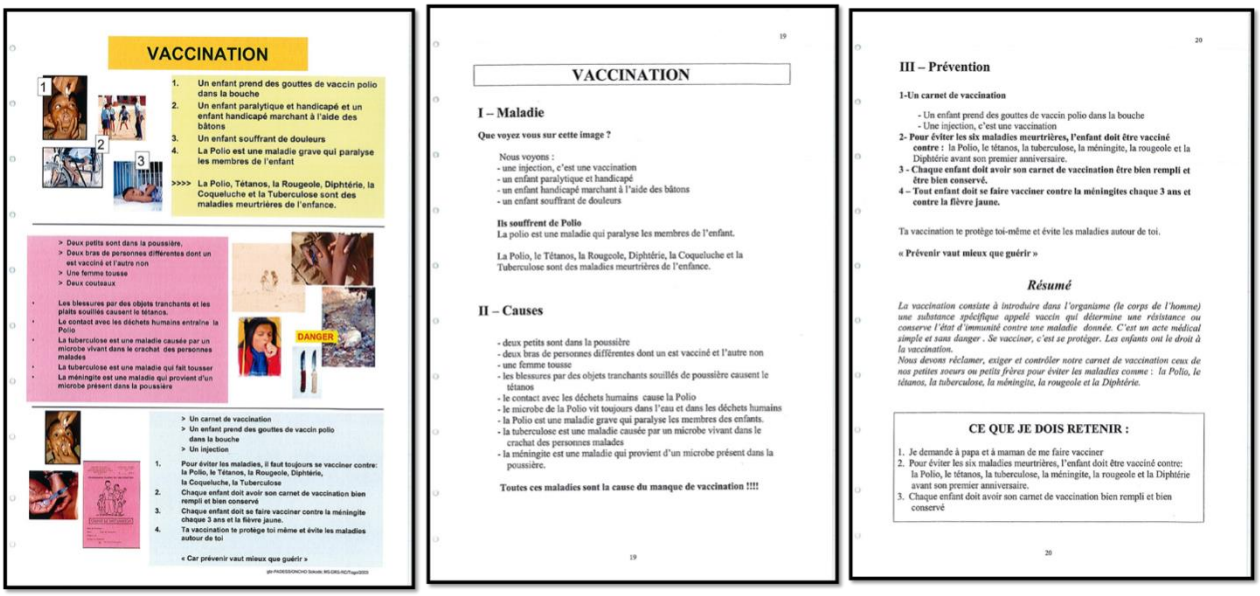


Figure 19. Teaching method on vaccination (disease, causes, prevention) in primary schools. Vaccination is the most effective method of preventing infectious diseases in children. Vaccination is largely responsible for the worldwide eradication of smallpox and diseases control such as polio, measles, and tetanus.

Teaching method

The user (teacher) must not show immediately the side that contains answers and the title (topic) to school children. It is better to ask motivation questions related to the subject presented before. After receiving the proposal responses from students, the teacher can clarify the subject by presenting answers proposed on IEC posters

and manuals. In conclusion the teacher can ask additional questions and receive student's questions for clarifications and comments.

Training sessions
Educational Posters:
Structure of Poster

Each poster is structured as follows:
The first part of the poster shows a series of pictures presenting the disease. The second part presents a series of pictures showing the mode contraction of this disease and the third part shows a set of images offering the healing methods and treatment. This structure allows schoolchildren to recognize and understand the different diseases and receives notions about the modes of contractions and treatments methods.
This type of education promotes the awakening of intelligence in children, which leads him to doubt sur certain habits of his daily life.

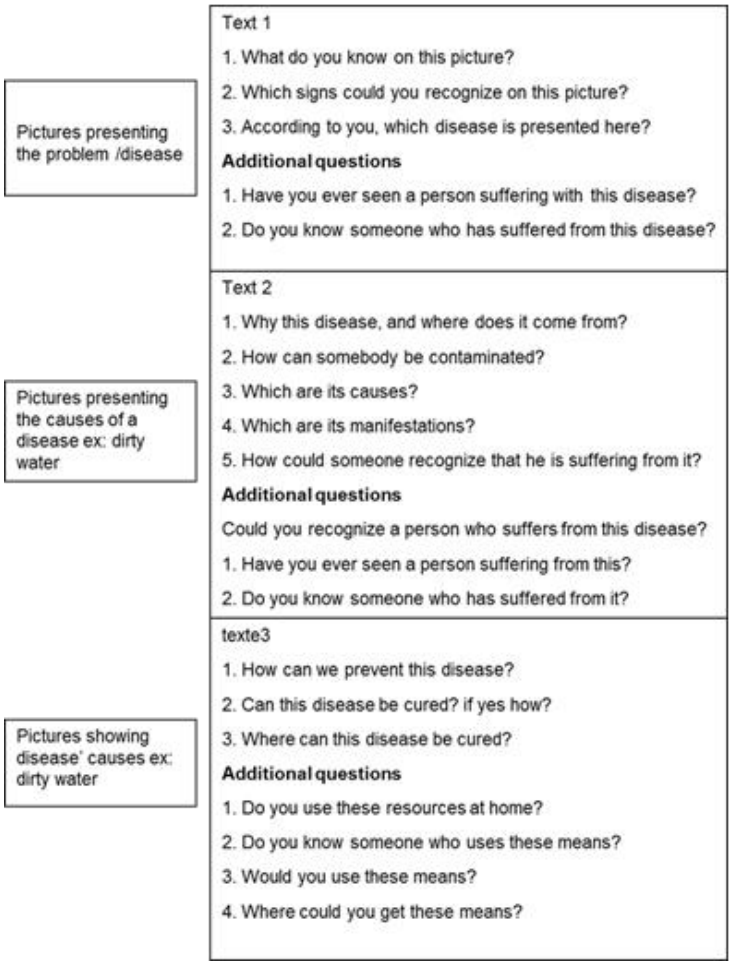


Figure 20. Posters design plan. The structure of the educational poster and the questions which can be asked in order to understand the content and to learn about the diseases and the subject

The educational posters are presented in a 60cm/100cm format attached to a solid frame, they are easy to carry and resistant to various weather conditions (dry wind Harmattan and rains) in central region of Togo.
Each poster is structured as follows:
In the first part shows a series of pictures presenting various diseases taught in the IEC programs. On the second part, another series of pictures are displayed and show the mode of diseases transmission and the last part presents a set of pictures showing disease healing/cure methods and treatment. This structure allows school children to easily recognize different diseases presented on the poster and understand the notions about the modes of contraction, prevention and treatment options. This approach of education awakes and develops school children aptitude in new behavior acquirement.

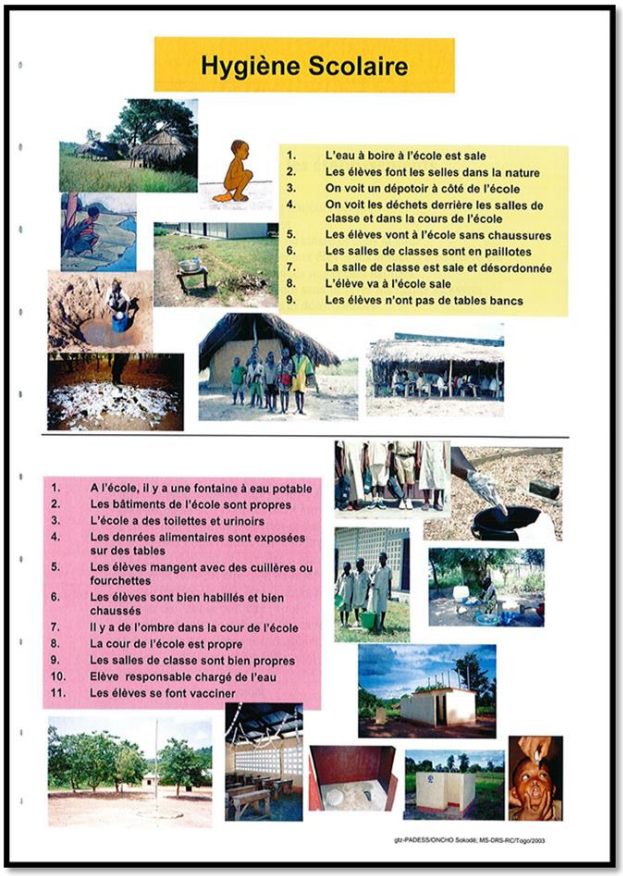


Figure 21.

Figure 22.

Figure 21. Post on hygiene in school: first part presenting insalubrity problems in schools, the second part showing the adequate hygiene conditions required in schools. The main objectives of school hygiene education are to improve the behavior through useful practices related to personal hygiene, water, food, domestic and public hygiene in children. Figure 22. Poster on malaria. First part showing the symptoms of the disease, the second part presenting the causes of the disease and the Third part proposing the prevention methods of malaria.

Figure 23.

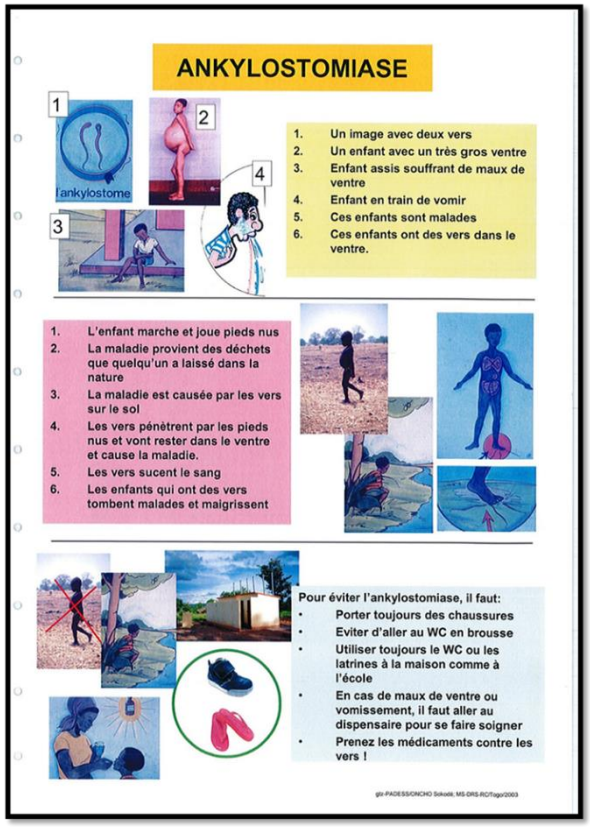


Figure 24.

Figure 23. Post on schistosomiasis/bilharziasis, first part presenting the symptoms of the disease, the second part showing the causes of the disease and the Third part proposing schistosomiasis prevention methods. It's a disease caused by parasitic flatworms called *Schistosoma spp*. Signs and symptoms may include abdominal pain, diarrhea, bloody stool, or blood in the urine. A long term infection may cause liver damage, kidney failure, infertility, or bladder cancer. In children, it may cause poor growth and cognitive impairment. Figure 24. Post on the Hookworm: this disease is caused by a parasitic blood-sucking roundworm. Hookworms infection in children can cause intellectual and growth problems. The first part of the post is showing the symptoms of the disease, the second part presenting the causes of the disease and the Third part proposing hookworm infection's prevention methods.

Note that topics have also been developed on roundworm, river blindness (onchocerciasis), HIV / AIDS and tuberculosis (confer Annex)

Figure 25. Posts on roundworm, river blindness (onchocerciasis), HIV/AIDS and tuberculosis (confer Annex)

Verification of the content

After posters presentation and their introduction to school children, the "teacher" must ensure that all of them can understand the poster's content, he must ask questions and then listen and record all the school children's responses to enable their understanding of the various subjects taught. The purpose of the posters is to educate students, the additional questions are asked to allow each student to express what is included in the presented pictures. Here the teacher can be followed by the whole class, questions can also be proposed to the class by rows according to the disposition and the number of students in the classroom.

Figure 26. ORL's field activities on a rural track during rainy season in the central region of Togo (above). Examples for rural and semi-urban EPP with children at the recreation pause in the school yard (below).

Assessment

Onchocerciasis Reference Laboratory (ORL)

The laboratory works, i.e. stool and urine samples analysis were performed in the Onchocerciasis Reference Laboratory (ORL). This laboratory is a cooperative institution created by the cooperation between Togo and the Republic of Germany in 1977. It was located in Togo at the National Institute of Hygiene (INH) and was responsible at that period for onchocerciasis monitoring. In 1980s, according to the resurgence of the disease (onchocerciasis) in the northern parts of Togo, the ORL was relocated to Sokodé in the Central Region. From 2001 onwards the ORL conducted regional surveys and research on the parasitological status of school-age children and since then it is part of the school health and hygiene program for the Central Region of Togo (Figure 8). The ORL activities encompass the control of parasite infections in schools, promoting health in school children, supporting the selected EPPs with effective and regular lessons and knowledge in practice of hygiene and disease prevention, strengthen the fight against parasitic diseases by directing school-children and teachers to understand the importance of hygiene as preventive measures required to avoid parasite infections. The ORL organizes meetings and exchanges, training (seminars, conferences, workshops) with teachers in schools, provides to the EPPs (Ecole Primaire Publique) education materials (posters and education manuals) to enhance knowledge on hygiene practice and how to prevent

parasite infections, and conducts sensitization sessions in the selected EPPs. The ORL has adopted activities that initiate and support therapeutic interventions against parasite infections not only in schools.

The Questionnaire

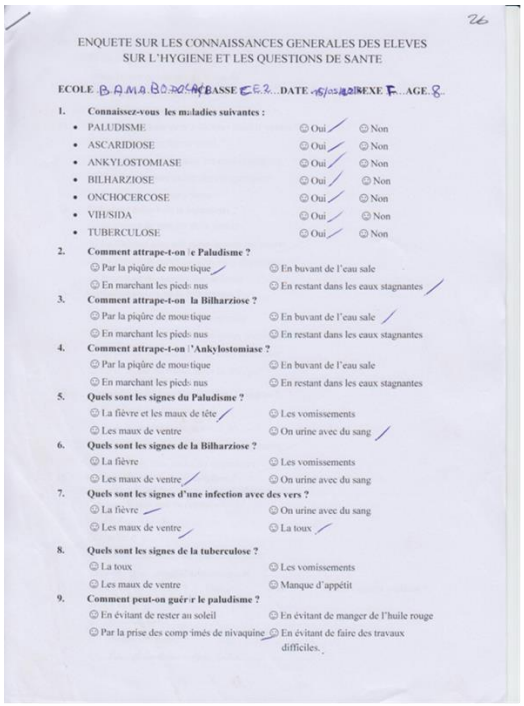
In the selected public primary schools (EPP), educational modules based on the principles of Information-Education-Communication (IEC) were introduced, and a questionnaire on several aspects of health and hygiene was applied. School children knowledge on parasite infections, on disease transmission and prevention, vaccination and general aspects of hygiene were assessed repeatedly over years.
For the present study, the school children knowledge on parasitic infections was evaluated with a questionnaire which was developed in collaboration with teachers, health workers, medical assistants and professionals from infectious disease control programs (ORL, gtz-PADESS; Plan-Togo).
The questionnaire encloses 35 questions on various parasitic diseases, their signs, preventive and curative measures as well as aspects on hygiene. The content of the present questionnaire was adapted to primary public schools (EPP) and developed to measure school children knowledge on hygiene at home and in schools. The knowledge about several diseases and their mode of transmission, treatment and prevention was evaluated, and the questionnaire should also help, after statistical analyzes, to assess the impact of IEC on parasitic infection levels in the different study groups.
In order to improve school children knowledge on health and hygiene in the selected schools, a communicative manual for behavior changes in health was developed. Posters were introduced in the selected schools for health education, and these educational materials were available in schools to enhance children knowledge on the mode of transmission and prevention of parasites infections and to reduce re-infection. In parallel, the posters and manuals were used as educational material for teachers to easily transmit information on health and hygiene to children. The questionnaire developed was for knowledge control in children and was based on the content of these educational materials.

The students' knowledge and teachers' training on parasite diseases

The teachers' and students' training in the field of health and hygiene concentrated mainly on the knowledge and aspects of the main parasite infections, parasite transmission, disease prevention, signs of disease and cure. For teachers the focus extended on de-worming campaigns, mass drug administrations and educational materials those supplemented in schools. The interventions were implemented for several years through the ORL project activities (Health and School Hygiene).

Questionnaires submitted to school children

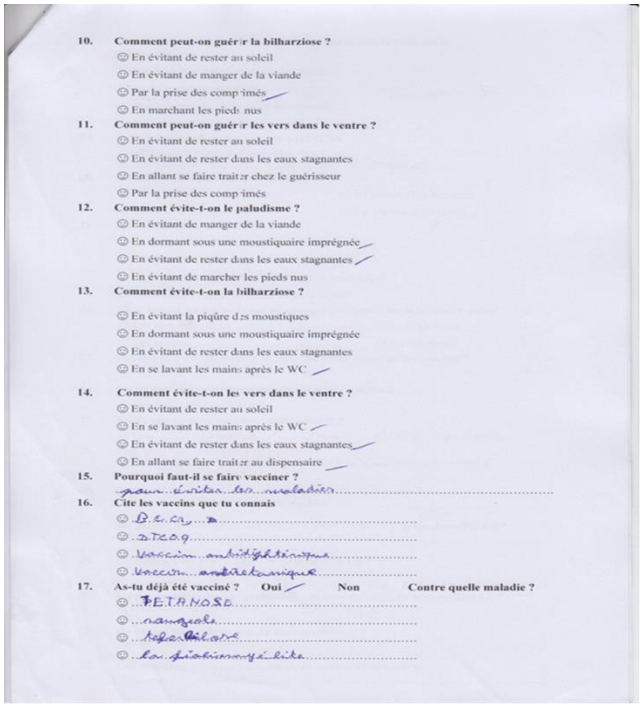
Questionnaire PAGE 1+2



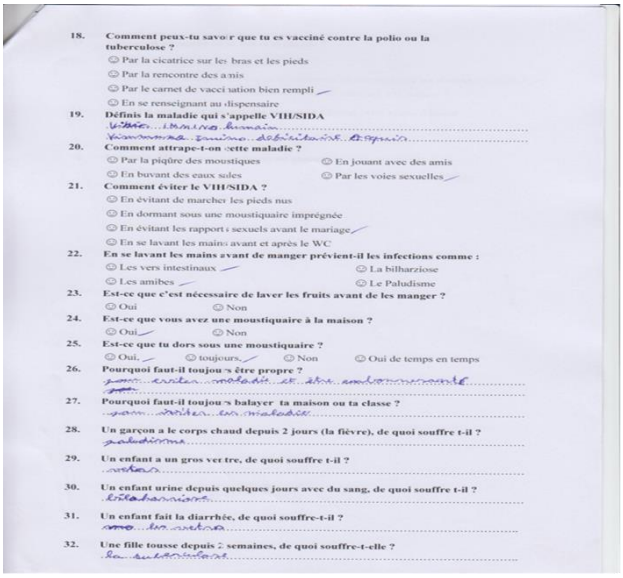
ENQUETE SUR LES CONNAISSANCES GENERALES DES ELEVES
SUR L'HYGIENE ET LES QUESTIONS DE SANTE

ECOLE BAMABOKA CLASSE CE2 DATE 16/03/2018 SEXE F AGE 8

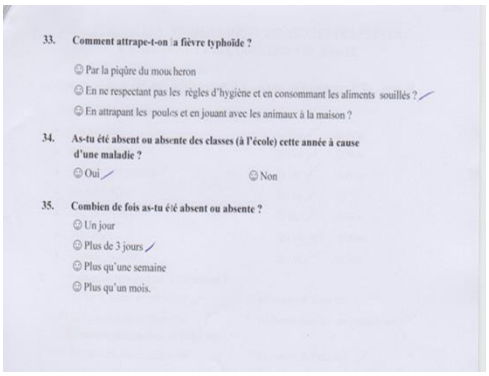
1. **Connaissez-vous les maladies suivantes :**
   - PALUDISME ☺ Oui ☺ Non
   - ASCARIDIOSE ☺ Oui ☺ Non
   - ANKYLOSTOMIASE ☺ Oui ☺ Non
   - BILHARZIOSE ☺ Oui ☺ Non
   - ONCHOCERCOSE ☺ Oui ☺ Non
   - VIH/SIDA ☺ Oui ☺ Non
   - TUBERCULOSE ☺ Oui ☺ Non
2. **Comment attrape-t-on le Paludisme ?**
   ☺ Par la piqûre de moustique ☺ En buvant de l'eau sale
   ☺ En marchant les pieds nus ☺ En restant dans les eaux stagnantes
3. **Comment attrape-t-on la Bilharziose ?**
   ☺ Par la piqûre de moustique ☺ En buvant de l'eau sale
   ☺ En marchant les pieds nus ☺ En restant dans les eaux stagnantes
4. **Comment attrape-t-on l'Ankylostomiase ?**
   ☺ Par la piqûre de moustique ☺ En buvant de l'eau sale
   ☺ En marchant les pieds nus ☺ En restant dans les eaux stagnantes
5. **Quels sont les signes du Paludisme ?**
   ☺ La fièvre et les maux de tête ☺ Les vomissements
   ☺ Les maux de ventre ☺ On urine avec du sang
6. **Quels sont les signes de la Bilharziose ?**
   ☺ La fièvre ☺ Les vomissements
   ☺ Les maux de ventre ☺ On urine avec du sang
7. **Quels sont les signes d'une infection avec des vers ?**
   ☺ La fièvre ☺ On urine avec du sang
   ☺ Les maux de ventre ☺ La toux
8. **Quels sont les signes de la tuberculose ?**
   ☺ La toux ☺ Les vomissements
   ☺ Les maux de ventre ☺ Manque d'appétit
9. **Comment peut-on guérir le paludisme ?**
   ☺ En évitant de rester au soleil ☺ En évitant de manger de l'huile rouge
   ☺ Par la prise des comprimés de nivaquine ☺ En évitant de faire des travaux difficiles.



10. **Comment peut-on guérir la bilharziose ?**
    ☺ En évitant de rester au soleil
    ☺ En évitant de manger de la viande
    ☺ Par la prise des comprimés
    ☺ En marchant les pieds nus
11. **Comment peut-on guérir les vers dans le ventre ?**
    ☺ En évitant de rester au soleil
    ☺ En évitant de rester dans les eaux stagnantes
    ☺ En allant se faire traiter chez le guérisseur
    ☺ Par la prise des comprimés
12. **Comment évite-t-on le paludisme ?**
    ☺ En évitant de manger de la viande
    ☺ En dormant sous une moustiquaire imprégnée
    ☺ En évitant de rester dans les eaux stagnantes
    ☺ En évitant de marcher les pieds nus
13. **Comment évite-t-on la bilharziose ?**
    ☺ En évitant la piqûre des moustiques
    ☺ En dormant sous une moustiquaire imprégnée
    ☺ En évitant de rester dans les eaux stagnantes
    ☺ En se lavant les mains après le WC
14. **Comment évite-t-on les vers dans le ventre ?**
    ☺ En évitant de rester au soleil
    ☺ En se lavant les mains après le WC
    ☺ En évitant de rester dans les eaux stagnantes
    ☺ En allant se faire traiter au dispensaire
15. **Pourquoi faut-il se faire vacciner ?**
    pour éviter les maladies
16. **Cite les vaccins que tu connais**
    ☺ B.C.G.
    ☺ D.T.C.O.Q
    ☺ Vaccin antityphoïdique
    ☺ Vaccin antirabique
17. **As-tu déjà été vacciné ?** **Oui** **Non** **Contre quelle maladie ?**
    ☺ TETANOS
    ☺ rougeole
    ☺ hépatite
    ☺ la fièvre jaune



18. **Comment peux-tu savoir que tu es vacciné contre la polio ou la tuberculose ?**
    ☺ Par la cicatrice sur les bras et les pieds
    ☺ Par la rencontre des amis
    ☺ Par le carnet de vaccination bien rempli
    ☺ En se renseignant au dispensaire
19. **Définis la maladie qui s'appelle VIH/SIDA**
    Virus humain
    Virus qui détruit le système immunitaire
20. **Comment attrape-t-on cette maladie ?**
    ☺ Par la piqûre des moustiques ☺ En jouant avec des amis
    ☺ En buvant des eaux sales ☺ Par les voies sexuelles
21. **Comment éviter le VIH/SIDA ?**
    ☺ En évitant de marcher les pieds nus
    ☺ En dormant sous une moustiquaire imprégnée
    ☺ En évitant les rapports sexuels avant le mariage
    ☺ En se lavant les mains avant et après le WC
22. **En se lavant les mains avant de manger prévient-il les infections comme :**
    ☺ Les vers intestinaux ☺ La bilharziose
    ☺ Les amibes ☺ Le Paludisme
23. **Est-ce que c'est nécessaire de laver les fruits avant de les manger ?**
    ☺ Oui ☺ Non
24. **Est-ce que vous avez une moustiquaire à la maison ?**
    ☺ Oui ☺ Non
25. **Est-ce que tu dors sous une moustiquaire ?**
    ☺ Oui, ☺ toujours, ☺ Non ☺ Oui de temps en temps
26. **Pourquoi faut-il toujours être propre ?**
    pour éviter maladie et être environnement propre
27. **Pourquoi faut-il toujours balayer ta maison ou ta classe ?**
    pour éviter les maladies
28. **Un garçon a le corps chaud depuis 2 jours (la fièvre), de quoi souffre t-il ?**
    paludisme
29. **Un enfant a un gros ventre, de quoi souffre t-il ?**
    vers
30. **Un enfant urine depuis quelques jours avec du sang, de quoi souffre t-il ?**
    bilharziose
31. **Un enfant fait la diarrhée, de quoi souffre-t-il ?**
    les vers
32. **Une fille tousse depuis 2 semaines, de quoi souffre-t-elle ?**
    la tuberculose



33. **Comment attrape-t-on la fièvre typhoïde ?**
    ☺ Par la piqûre du moucheron
    ☺ En ne respectant pas les règles d'hygiène et en consommant les aliments souillés ?
    ☺ En attrapant les poules et en jouant avec les animaux à la maison ?
34. **As-tu été absent ou absente des classes (à l'école) cette année à cause d'une maladie ?**
    ☺ Oui ☺ Non
35. **Combien de fois as-tu été absent ou absente ?**
    ☺ Un jour
    ☺ Plus de 3 jours
    ☺ Plus qu'une semaine
    ☺ Plus qu'un mois.

Questionnaire PAGE 3+4

Questionnaire in primary public schools (EPP)

Figure 27. Questionnaire application during field works in EPP.

The questionnaire is distributed to school children in a classroom. The questions are read and their children choose the answers. The questionnaire consists of multiple choice questions and short writings.

Categories of questions asked in questionnaire

The knowledge of parasitic diseases their causes, symptoms and prevention methods are assessed.

- ***Known diseases:***

Here the student should tick the names of known diseases listed in the questionnaire: e.g. Malaria, Ascariasis, Hookworm, Schistosomiasis, Onchocerciasis, AIDS, and Tuberculosis.

- ***Causes of diseases***

Here the student should tick disease causes listed in the questionnaire: e.g. those they consider to be true: e.g. cause for Malaria, cause for Schistosomiasis, and cause for hookworm

- ***Sign of the disease:***

Here the student should tick diseases signs listed in the questionnaire, those he believes to be true: e.g. sign of Malaria, Sign of Schistosomiasis, sign of infestations with worms, sign of tuberculosis.

- ***Diseases Cure:***

Here the student should tick among the listed propositions in the questionnaire, those he believes to be true: e.g. how to cure Malaria, how to cure Bilharzia

- ***How to cure infections with worms.***

The student should tick among listed propositions in the questionnaire, those he believes to be true

- ***How to avoid infections***

How can somebody get typhoid fever?

The student should tick among listed propositions, those he believes to be true: e.g. how to avoid worms, how to avoid Malaria, how to avoid Bilharzia, how to avoid having in the stomach.

- ***Knowledge and attitudes on vaccination,***

In this second part of the questionnaire, the student should not only tick the answers but also write the answers with his own words, e.g. he has to write the known vaccine's names.

HIV and AIDS

In this section, the student should not only tick the answers but also write some of the answers in his own words, e.g. defining HIV and AIDS, how to avoid AIDS etc..,

Aspects of personal, household and food hygiene

The student should not only tick the answers but also write some of the answers in his own words, e.g. do you have a mosquito nets at home? Do you sleep under the mosquito net? Is it necessary to wash fruits before eating them? Why do we need to be always clean, why do we need to sweep the classroom or our rooms?

- ***Disease symptoms***

Here as well, the student should not only tick the correct answers but also write some of the answers in his own words; e.g. Reason for fever (Hot body) since 2 weeks, Reason for a swollen belly, reason for urinate with blood, Reason vomiting, Reason for diarrhea, Reason for cough for two weeks etc..

- ***Absenteeism at school***

Here the student will mention how many time he has been absent in class because of illness.

- ***Typhoid fever***

In this part, they will have to tick the right answers asked on typhoid fever.

Data collection

Parasitological examinations

During the present research, 3 clinic analyzes were performed with the stool and urine samples from each student.

Fresh Stool Examination

Using a small plastic spatula, a small amount of freshly collected stool is placed on a microscope slide, then mixed with iodine solution (Lugol Solution) and examined under a microscope. The eggs of STH (hookworm, whipworm, tapeworm and roundworm) and of intestinal *Schistosoma mansoni* can then be identified, and also the presence of protozoan parasites (amoeba, giardia) detected.

Fresh Stool Examination

The Kato Katz technique is a quantitative stool analysis which was used to determine the intensity of intestinal helminthes infections. Kato Katz is for qualitative and semi-quantitative diagnosis of intestinal helminthic infestations caused by Ascaris *lumbricoides*, *Trichuris trichiura*, hookworm and especially intestinal *Schistosoma*

spp. TheWHO has recommended the Kato Katz technique in areas with moderate to high transmission rates of soil transmitted helminthes, i.e. where the proportion of helminthes-infected individuals is 20–50% or where prevalence of intestinal schistosomiasis ranges from 10% to 50%. In areas where the prevalence of soil transmitted helminths (STH) is <20%, the sensitivity of this technique makes it less appropriate, and more sensitive tools should be used.

For the Kato-Katz technique, a bean-size quantity of stool is placed on a clean paper and a sieve-shaped nylon fabric piece is placed on the stool. A small pressure is exerted on the top such that the stool is filtrated through the mesh and accumulated above. With a flat spatula scraped over the top surface of the screen will collect the filtered stool. A mold is placed on a microscope slide, and the screen-filtered stool collected by the spatula is then filled in the hole of the mold such that the hole is completely filled. The spatula is passed over the filled mold to remove residue from the edges of the hole. The mold is then withdrawn carefully such that a cylinder of feces is left on the microscope slide. The fecal material is then covered with a cellophane tape pre-soaked in green Malachit. Another microscope slide is inverted on the cylinder stool sample and under firm pressure against the hydrophilic cellophane tape the sample is spread evenly. The preparation is then placed on the bench with the covering cellophane at the top to allow evaporation of remaining liquids. For all helminthes, except hookworm eggs, the slide is retained for one or more hours at room temperature before microscopic examination. WHO recommends using the Kato–Katz methodology for measuring STH and intestinal *S. mansoni* eggs because it is cheap, will give a standardized reading (eggs per gram of stool) and the technique is easy to learn. The eggs of the three STH (hookworm, whipworm and roundworm) and of intestinal *S. mansoni* can then be identified and counted. Hookworm eggs disappear within a few hours, thus it is important to read the slide within 2 hours of its preparation (WHO, 2004).

Figure 28

Figure 29

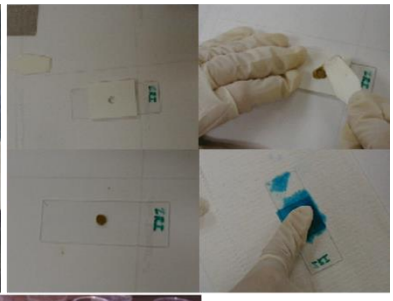


Figure 30

Figure: 28, 29. Stool and urine samples collection in the field. Here a Togolese Medical Assistant and a German student are collecting samples from school children. The urine samples (Figure 30.) were collected into 50ml tubes and after centrifugation

the egg in the sediment were counted and the intensity of infection with *Schistosoma heamatobium* (number of eggs per 10 ml of urine) determined. With some samples it is already possible to distinguish between bloody and normal urines.

Centrifugation method for Schistosoma heamatobium egg detection

For the detection of urinary schistosomiasis children collected in the morning approximately 50 ml of their urine into a collection tube. These urines were then transported cooled and protected from light, and upon arrival in the ORL from the bottom of the collection tubes using a Pasteur pipette 10ml of urine were collected into another tube. This tube was then centrifuged for 2 minutes at 2000rpm, then the pellet recovered and Fieldwork, measurement of hemoglobin.
For the hemoglobin determination, a portable HemoCue HB device was used (Fig. 30 and 31). The procedure and involves taking capillary finger prick blood using a lancet suitable for children (painless), then a drop of blood is put into the slot of a strip of the measuring device, thereafter the strip introduced into the apparatus and 5-10 seconds later, the result is displayed as g/dl hemoglobin.

Figure 31

Figure 32

Figure 31, 32. Determination of hemoglobin concentration (g/dl) in peripheral blood was performed in the field (in schools). Participants were finger pricked and the Hb (hemoglobin) concentration was determined with a mobile device HemoCue HB, Figure 32.

Methodology of stool and urine sample examinations

The methodology consisted to collect urine and stool samples for parasitological examinations. After stool and urine samples analyzes, anti-parasitic treatments (Albendazol, Praziquantel) were applied immediately to infected cases. Parasitological surveys were conducted during the dry season in the months of November to March. During this period, hookworm transmission is low, this allows a sensitive regression of the parasite load when the re-infection rates are low. However, with water concentration in creeks, rivers and dams during the dry season the exposition and infection rate with schistosomiasis is intense.
At the beginning of this study, and under surveillance by the ORL all the school children were systematically de-wormed in the selected schools.

Each year a control of the treatment efficacy was performed in the last months of the school year meaning 4 to 5 months after the last treatment, and positive cases received the indicated treatments.
In each school, 30 students were randomly drawn for parasitological examinations and the questionnaire, for this, an appointment was made for questionnaires, and stool and urine samples collection.
Mass de-worming surveyed by the ORL was applied in all schools covered by the present research, and mass treatment was with albendazole (400 mg single dose). Children infected with Schistosoma were treated with praziquantel (600mg) according to their weight.

Data analysis

Microsoft Excel 2007" was used for data entry and JMP and "Sigma Plot 11" for the statistical data analysis. The statistical method of "error bar" was used to express the questionnaire data by graphical representation of interquartile values representing 95% of the values of each group, standard deviations and dispersion (minimum, maximum).The Kruskal-Wallis test was used for comparison of levels of knowledge between groups. The method of simple linear regression was used to find the relationship between the different study groups. The significance level of $p = 0.05$ was applied. The logarithm to base 10 was used to stabilize widely dispersed data. A star (*) precedes p and its value when the difference between groups was not statistically significant, two stars (**) to indicate significant differences.

V. RESULTS

5.1 Prevalence and intensity of intestinal helminth infections in schoolchildren in the Central Region (RC) of Togo

The present study took place in the central region of Togo. In this context, 106 (Table 1) schools have been identified for a study based on parasite infections as well as knowledge and attitudes in health and school hygiene in some EPPs in the study area. A questionnaire were applied and stools and urines samples were also collected for parasitological examinations for detection of intestinal helminths and urinary schistosomiasis parasites. In each school, 30 school children were selected for a questionnaire as well as for urine and stool samples collection. In the study group (EPP-IEC), IEC sessions and parasitological surveys were repeated for years.

The prevalence of parasitic infections after 6 years of parasite infection control and school-based IEC activities revealed that the prevalence of hookworm was at 25% and the prevalence of urinary schistosomiasis at 11%. The hookworm and Schistosoma infection prevalence remained high after de-worming with albendazol and praziquantel, however, the parasite infection intensities had declined significantly compared with the first year of activities. Children were often co-infected with both hookworm and schistosomiasis. *Schistosoma haematobium* affected most EPP with a prevalence of 0% up to 34%, while infections with *Ankylostoma duodenale* varied from 7% to 46%. Table 1, shows the list of all schools involved in the present study. Note that schools in which the number of school children selected for the various examinations and questionnaire is more than 30 are for the most part, schools from the study group (EPP-IEC). This group has been followed for years with urine and stools samples parasitological examinations, IEC sessions as well as for periodical deworming campaigns. In these schools, periodic controls for knowledge on parasitic infections, their mode of transmission and their mode of cure were applied during IEC sessions. Deworming campaigns have been applied as well. It should also be noted that teachers in EPP-IEC schools have also benefited from lessons learned on various aspects of parasitic infections and hygiene practices in schools.

Schools in which school children selected for various examinations and tests are about more or less 30 pupils, constitute the schools of the control group (EPP-Plan1) and are also located in semi urban and in rural areas. These schools have not benefited from the lessons learned during IEC sessions and did not received urine and stools samples parasitological examinations. Teachers in these schools did not also have benefited from IEC sessions as it has been done in the study group (EPP-IEC). This was the first time for the control group (EPP-Plan 1) to face to such interventions in schools. For the whole study, a total of 8942 stool and urine examinations were performed. Regarding hookworm infections, the median was about 222 eggs/g stools analyzed (Table 3.), while for schistosomiasis, this median was about 2 eggs/10 ml of urine analyzed (Table 3). Concerning stool samples examined, the mean found for hookworm eggs was about 312 eggs/g stools whereas for the urine, the mean was about 19 eggs/10 ml of urine analyzed (Table 3).

Primary Public School in RC	Children examined	Mean Hookworm eggs/g stool	Mean Schistosoma Eggs/10ml urine
Abatchang	30	78	0
Abidjande	30	594	0
Adjigbe	30	116	0
Afema	30	227	0
Affem-Boussou	30	262	0
Affem-Kabye	30	570	0
Afoule	30	31	0
Agan	30	864	0
Agodeka	30	250	0
Agomado	30	106	0
Agoulou A+B	30	67	0
Agoulou Plateau	30	75	0
Akamade	305	581	11
Amoude	30	46	0
Amoude Mo	27	353	0
Aou Mono Sotouboua	30	324	0
Aou Mono Tchaoudjo	29	108	0
Aouda	30	35	0
Aouda Controle	30	1697	0
Assouma-Kodji / A	30	154	0
Atake	30	582	0
Ataworo	30	948	0
Atikpai-EstMono	30	352	0
Atikpai-Losso	30	224	0
Aviation	110	196	86
Ayelo-Abinga	30	646	0
Ayona	30	396	0
Bamabodolo	90	38	1
Barriere	283	97	13
Bila	30	18	0
Birini-Doubide	65	113	1
Boloybo	157	841	184
Bounatche	30	280	0
Bouzalo Haut	30	535	0
Dalanda	30	745	0
Dantcho	28	109	0
Defale	30	78	0
Didaoure	244	60	23
Digina	30	192	0
Djamde-Mono	30	889	0
EdilAgbayo	30	668	0
Edil de Damala	30	472	1
EdilKomsade	30	166	0
Effoufami	30	366	0

Fandogo-Oligo	30	191	0
Fawie-Cope	30	70	0
Fazao	30	125	0
Igboloudja	30	389	0
Igbomedji	30	488	0
Jelivo	66	79	0
Kable-Cope	30	550	0
Komah III	495	711	1
Kossobio	36	50	2
Koulounde I	549	526	4
Koulounde II	723	1158	18
Kouvon	30	138	0
Kpalafoulassi	30	129	0
Kpangalam	44	694	3
KparaKpara	30	35	0
Kparatao	373	293	1
Kpario	65	147	0
Kpatakpani	30	87	0
Kpeyi-Tchila	30	879	0
Kpondjodjo	806	401	146
Kuwawu-Woro	632	179	28
Larini	29	203	0
Limzemouda	30	59	0
Malamboua	30	227	0
Mono	30	238	0
Nada	460	320	3
Nandjoubi	30	48	0
Niamtougou-Cope	30	644	0
N'Kognon	30	98	0
N'Tsourou I	30	270	0
N'Tsourou II	65	302	13
Ofe-Awo	30	281	0
Ogou-Bretelle	30	377	0
Okpognedje	30	394	0
Oronko	30	33	0
Oudjomboi	30	65	0
Sabaringade	30	82	0
Sagbadai	64	125	0
Sakalao-Kope	29	84	0
Salimde	672	366	13
Samai	30	25	0
Tabalo I	65	97	0
Talkate Cope	30	124	0
Tchakpalade	90	401	7
Tchanie	30	194	0
Tcharebaou-Plateau	30	132	0
Tchebebe A	30	900	0
Tchebebe B	30	567	0

Tchekele	30	343	0
Tchoubong	31	486	0
Teheza	30	34	0
Tembio Pida	30	32	0
Tigbada	30	981	0
Togodo	30	349	0
Toukoudjou A	30	45	0
Toukoudjou B	30	119	0
Toule II	30	105	0
Wassarabo	30	150	0
YaraKabye A	30	221	0
YaraKabye B	30	367	0
Yeloum-Bagna	30	226	0
You	30	45	0
TOTAL rexamined	8942		
	TOTAL Median	222	2
	TOTAL Mean	312	19

Table 3.
Table 3. Presents details of the number of parasitological examinations performed in each school for the detection of hookworm eggs as well as for schistosomiasis in stool and urine samples collected from school children.

Hookworm			
0	4022	53,3	% NEG
1	3521	46,7	% POS

Table 4. Prevalence of Hookwormin school children examined

Thus, for hookworm, 4022 children were negative for the detection of hookworm eggs, (53.3%) of children examined were negative with Hookworms. While 3521 children were found to be positive with at least one egg of hookworm (infected with hookworm), which represents a percentage of 46.7% (Table 4).

In Table 4, the prevalence of single and double infections is presented for school children examined. Here, it should be noted that the total number of negative school children was about 4681, which represents a percentage of 53.3%. In this table it is observed that of all children examined, approximately half (46.7%) are positive ether for one or another of the two parasitic infections (hookworm eggs or schistosomiasis).

Schistosoma			
0	4349	77,1	% NEG
1	1289	22,9	% POS

Table 5. Prevalence of *Schistosoma haematobium* in school children

For urinary schistosomiasis children who were declared negative for the detection of schistosomiasis eggs were n=4349, which represents a percentage of 77.1%, while n=1289 children were reported to have at least one egg of *Schistosoma haematobium* in 10 ml of urine representing a percentage of 22.9% (Table 5).

PolyPara	No	%
NEG	4681	52,3
ONE	3712	41,5
TWO	549	6,1

Table 6. Prevalence of single and double infection with Hookworm and *Schistosoma haematobium*

In table 6 it is presented the single and poly parasitism in schools. Regarding single parasite infections, 3712 children were infected with one parasite, this corresponds to 41.5%. While 549 children were found to be infected with at least 2 parasites (6.1%) Table 6.

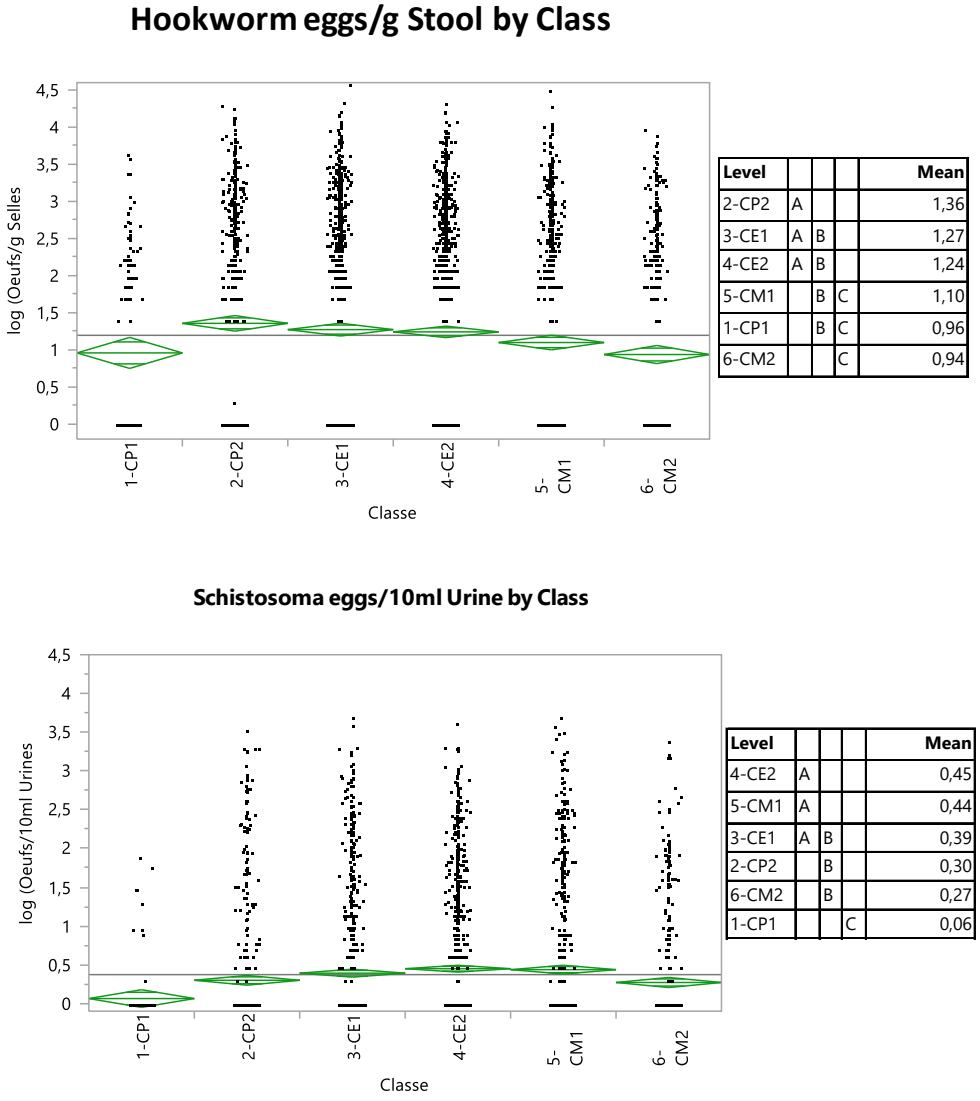
Table 7.

This table shows the number of children examined by class in the selected schools, the mean of hookworm eggs per gram stool and finally the mean *Schistosoma haematobium* eggs per 10 ml urine. In this table it is also presented the number of students examined and the number of students positive for each parasite (*Schistosoma haematobium*/Hookworm). It can thus be seen that the highest number of examinations carried out concerned the children from class CE2 with 1418 children examined and the lowest number of children examined is with the class CP1 with 237 children examined. Concerning the prevalence, the highest mean is found with the class of CE1 with an average of 655 eggs/g stool with hookworm. The highest mean found for schistosomiasis was with the class of CM1 with about 67 eggs/10ml of urine. Relating to the lowest means, it has been noted that the lowest mean is with the class of CP1 with 1eggs/10 ml of urine for schistosomiasis, while the lowest mean with hookworm eggs is still found with the class of CP1 where this average is about 163 eggs/g stool.

Classe	No examined	Mean Hookworm eggs/g stool	Mean Schistosoma eggs/10ml urine
CP1	237	163	1
CP2	766	720	45
CE1	1189	655	50
CE2	1418	526	40
CM1	878	525	67
CM2	579	308	24

Table 7. Intensity of hookworm and *Schistosoma haematobium* infections in school children examined by classes

The mean of the prevalence with hookworms is about 0.94 (lowest mean) for CM2, which is the last class in the primary school and about 0.96 for CP1, which is the first class in primary school. This prevalence with hookworm reached the average of 1.36 (highest mean) for the class CP2 and 1.27 for the class CE1. In this table it can also be seen that the prevalence of hookworm infections is high from the class CP2 to the class CM1. All these averages are found at the level of the general average of the whole group. It can be deduced that at the entrance and the leaving of Primary school, children are less parasitized than the intermediate classes in primary school.This is due to the interventions of hygiene and school health program.



Level				Mean
2-CP2	A			1,36
3-CE1	A	B		1,27
4-CE2	A	B		1,24
5-CM1		B	C	1,10
1-CP1		B	C	0,96
6-CM2			C	0,94

Level				Mean
4-CE2	A			0,45
5-CM1	A			0,44
3-CE1	A	B		0,39
2-CP2		B		0,30
6-CM2		B		0,27
1-CP1			C	0,06

Figure 33. The prevalence of schistosomiasis and hookworm infections by classes. Practically the same situation can be seen for both (hookworm infections and *Schistosoma heamatobium* infections)

Group levels which are not connected with the same letter are significantly different (Tukey Kramer test).

This table presents the intensities of infection by hookworm and schistosomiasis in the different classes, i.e. from CP1 to CM2. It can be seen that the intensity of parasite infections are lower in CP1 and higher from CP2 to CM1. In CM2 we can note that this intensity is also lower. Statistical analysis showed significant differences between some classes for example the difference is significant between CP2 and CM2; and Between CP2 and CP1.

Regarding the hookworm infections, the lowest means is found with the class of CM2 and CP1with a mean which is about 0.94 in CM2 and 0.96 for (CP1) with hookworm infections. The highest prevalence by classes is found with the class of CP2 with a mean of 1.36 (highest mean for the whole group). In this table, it is also seen that children enter and leave primary school (CP1, CM2) with less parasites while between the classes from CP2 to the class of CM1, they are often severely infected. It is seen with these classes (CP2 to CM1) that all means are found at the level of the general average of the whole study group.
Concerning the intensity of schistosomiasis infections, it is also noted that the most affected classes are the classes from CP2 to CM1 with the intensities in CE1, CE2 and CM1 above the general average. It can also be seen that the class of CP1 is the least infected. With the statistical analysis of these results it is possible to also found some significant differences between certain classes as for example the difference is significant between the CP1 and the CM2, the difference is also significant between the CP1 and the classes from CP2 to CM1. There is a significant difference between CM2 and CM1 and CE2 as well.

	Ancylostoma	Ancylostoma	Prevalence
Year	N (neg)	N (pos)	% (pos)
Before	307	448	59,34
1	134	115	46,18
2	338	287	45,92
3	138	131	48,70
4	24	6	20,00
5	286	60	17,34
6	180	26	12,62
7	467	159	25,40

Table 8. Presentation of hookworm infections load in the study group (EPP-IEC) from the beginning to year 7

It can be seen from this table that in year 1 the prevalence of hookworm infections in the control group schools was about 60%. Between year2 and year 4 the prevalence decreased and is and situated between 45 and 48%. With repetitive health and school hygiene intervention (stool examinations, deworming and IEC program) in schools, the prevalence decreased to 12.62% in year 7.

	Schistosoma haematobium	Schistosoma haematobium	
Year	N (neg)	N (poS)	% (pos)
Before	417	255	37,95
1	134	115	46,18
2	640	202	23,99
3	210	27	11,39
4	199	72	26,57
5	368	38	9,36
6	212	52	19,70
7	559	68	10,85

Table 9. Situation of urinary schistosomiasis infections load in the study group (EPP-IEC) from the beginning to year 7

In table 9 it can be seen from this table that in year1, the prevalence of urinary schistosomiasis in the study group EPPs was about 38%. This prevalence reached 46.18% in year2. With repetitive health and school hygiene intervention (stool examinations, deworming and IEC program) in schools, in year8 the prevalence of urinary schistosomiasis a decreased to 10.85% in schools.

5.2 Knowledge Scores in school children groups

It has been noticed that students' knowledge on parasitic diseases remained low, and required renewal and repeated supply of EPP with educational materials to enable teachers to implement educational and training sessions.
Regarding the questionnaire, a total of 3142 children were enrolled in this study, divided into four groups according to the number of IEC sessions received: EPP-IEC1 group (n=219), EPP-IEC2 group (n=184), EPP-IEC3 group (n=418) and EPP-Plan1 group (n=2321).
EPP-Plan1 Children from EPP-Plan1 Group (n=2321) had not been trained by IEC but MDA.
EPP-IEC1 group (n=219) received IEC once (teachers training, students' education and the distribution of educational materials on parasitic diseases) at the beginning of the present study in the first year.
EPP-IEC2 group (n=184) received IEC for 2 years and educational materials were available.
EPP-IEC3 group (n=418) received IEC for 3 years and educational materials were available.
A first data analysis has been made with all children from each group. As the groups were not balanced, a second data analysis was made considering the smallest group, EPP-IEC2. A randomly draw of 184 children from EPP-IEC1; EPP-IEC3 and EPP-Plan1 was made for a second balanced data analysis.
In total, eleven main analyzes were performed among these different groups with the questionnaire.

Figure 34 shows the total knowledge scores analysis by study groups
Figure 35 shows the subtotal analysis for known diseases by study groups
Figure 37 shows the subtotal analysis for diseases causes by study groups
Figure 38 shows the subtotal analysis for diseases signs by study groups
Figure 39 shows the subtotal analysis for diseases cure/healing by study groups
Figure 40 shows the subtotal analysis for diseases prevention by study groups
Figure 41 shows the subtotal analysis for vaccination by study groups
Figure 42 shows the subtotal analysis for HIV/AIDS by study groups
Figure 43 shows the subtotal analysis for hygiene by study groups
Figure 44 shows the subtotal analysis for mosquito net use by study groups
Figure 45 shows the subtotal analysis for absenteeism by study groups

Table 10. This table presents the main themes developed in the questionnaire to which the school children has responded. School children were evaluated according these main aspects on the diseases taught during the IEC sessions) Note the comparison of the level of absenteeism at school only introduced in EPP-IEC3 group. And this aspect was not considered in EPP-IEC1 and EPP-IEC2 groups at the very beginning.

Knowledge Scores in school children groups

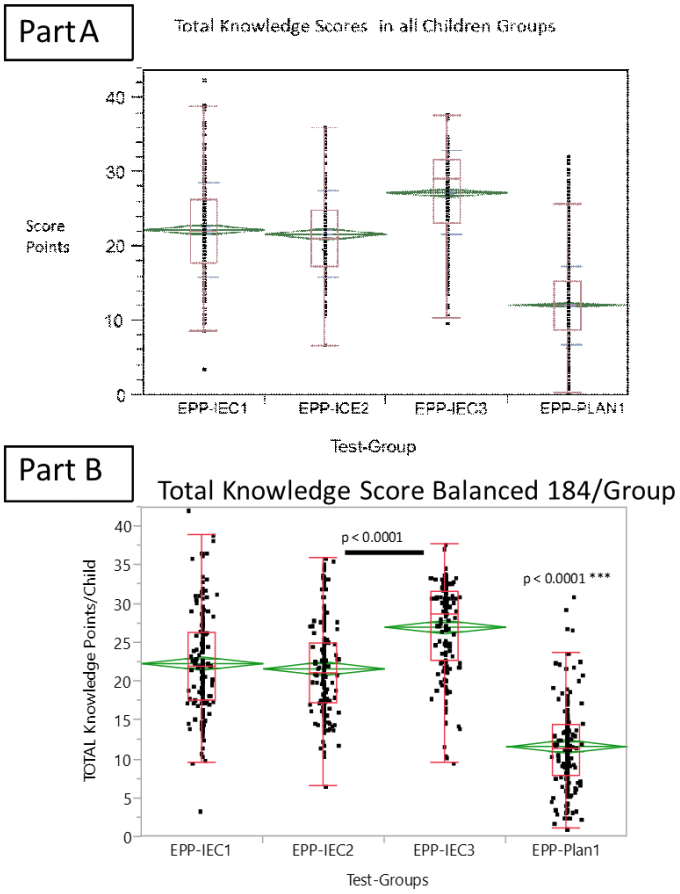


Figure 34. Total Knowledge scores in all children tested (Part A) and in the adjusted study groups (n=184 children/group) (Part B). Mean knowledge score with the 95% upper and lower confidence intervals are shown (green diamonds), the medians with

the 75% interquartile range are given in the box blots (red lines) and the mean with the standard deviations are shown as blue lines.

In Part A, the total knowledge score on diseases taught, the level of children knowledge remains almost unchanged between EPP-IEC1 and EPP-IEC2 groups in year1 and 2 separately. Whereas the EPP-IEC3 group in year 3 has a significant increased mean score (P<0.0001). The lowest score were found in EPP-Plan1 group, which has not receive EPP at all, here the lower mean score is ***p<0.0001 compared to the other groups.

Part B shows the equilibration analysis among different groups. Similar data as Figure 1a was observed. EPP-IEC3 group still has the highest score (P<0.0001). The EPP-Plan1 group is the lowest one.

For known diseases, a distinct increase in knowledge on different diseases is observed from group EPP-IEC1 to EPP-IEC3. The lowest score were found in group EPP-Plan1. An improvement level of knowledge about diseases taught to children is observed from this figure following IEC application in these schools from year1 to year3. For EPP-Plan1, the level of knowledge known is at the same level as in EPP-IEC1 group.

Part B shows a slight change in the level of knowledge of different diseases. Within EPP-IEC3 group, the level of children knowledge on different diseases has improved and the difference is significant when compared with other groups (P<0.0001).

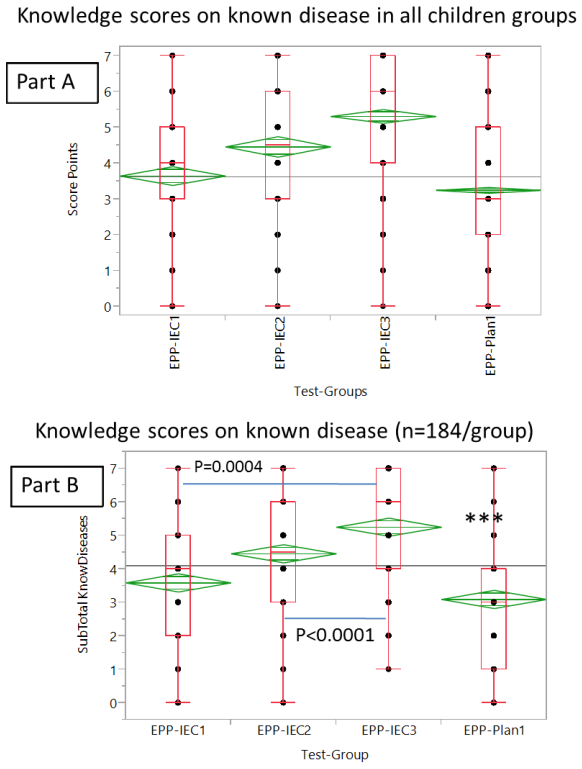


Figure 35. Part A shows the knowledge scores on known diseases after the IEC application in all children from the study groups. Part B shows the knowledge scores on known diseases in adjusted children groups (n=184 children/group). Diseases asked for were: malaria, tuberculosis, schistosomiasis, AIDS, hookworm infections, onchocerciasis and ascariasis.

Table 11. Mean number of diseases known by children in the balanced study groups (n=184/group)

Study Group	n	Mean Known disease	STD error	Min.	Max.
EPP-IEC1	184	3,6	0,1	0	7
EPP-IEC2	184	4,5	0,1	0	7
EPP-IEC3	184	5,3	0,1	1	7
EPP-Plan1	184	3,1	0,1	0	7

Table 11. Number of diseases known by children from the balanced study groups (n=184 children/group)

For all study groups (EPP-IEC1, EPP-IEC2, EPP-IEC3 and EPP-Plan1), the mean number of points obtained on known diseases is presented. The group with the lowest mean on disease recognition is EPP-Plan1 (that group did not benefit from IEC educational sessions). The study group with the highest mean points obtained is the EPP-IEC3 group (those with the highest number of IEC sessions).

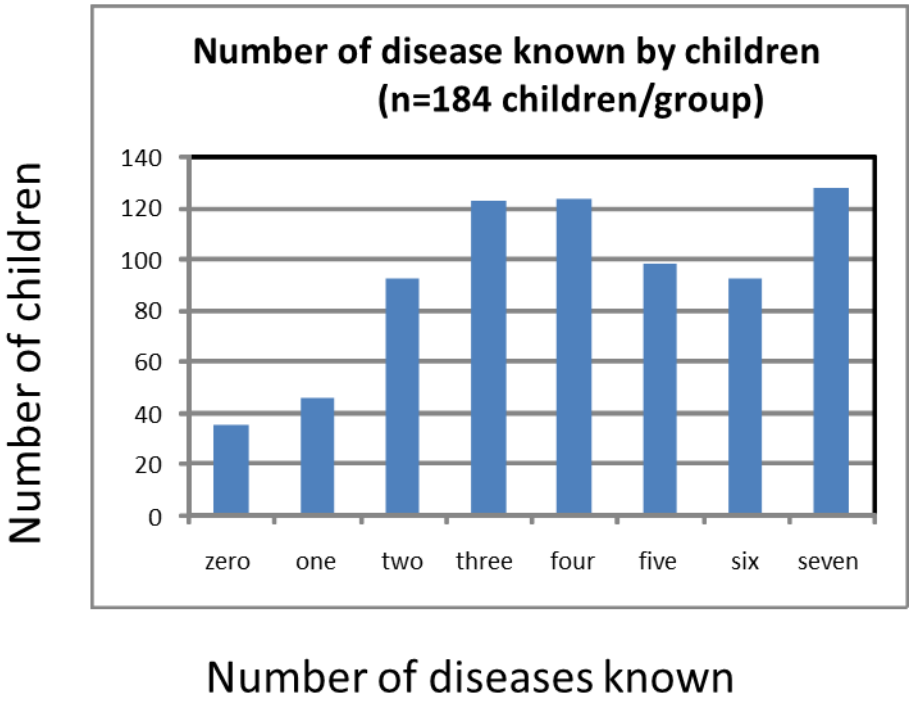


Figure 36. The graph presents the number of diseases known according to the questionnaire (malaria, hookworm, ascariasis, schistosomiasis, HIV/AIDS, tuberculosis, and onchocerciasis). In this figure, it can be seen that among the seven diseases asked for in the questionnaire, about 40 children did not recognize any disease and around 120 children recognized all of them.

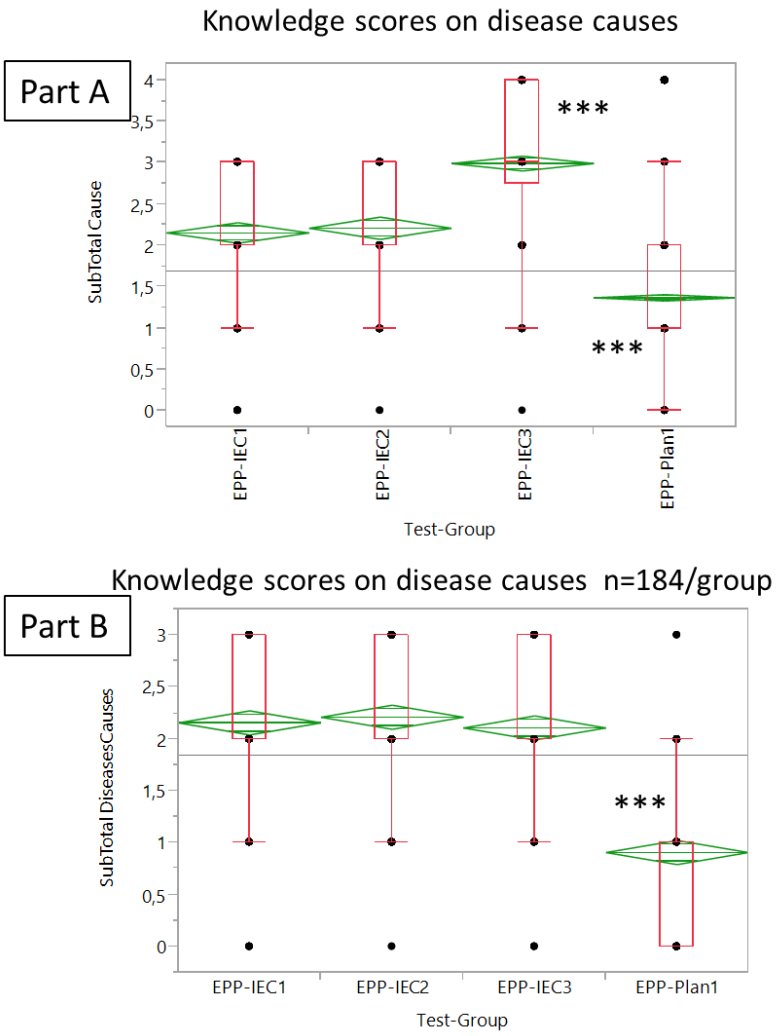
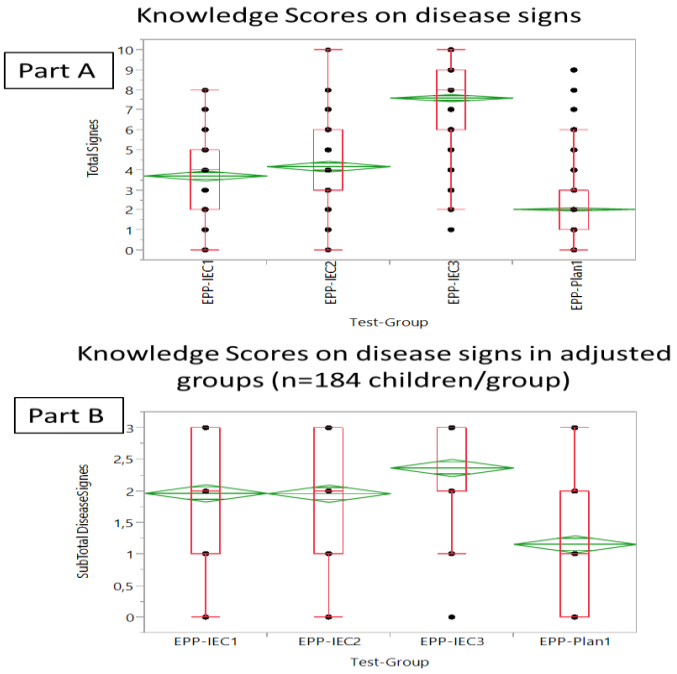


Figure 37.

Knowledge scores on disease causes an all children (Part A) interviewed and in adjusted groups (n=184 children/group) are shown. Significant differences between groups are indicated; the nonparametric Wilcoxon rank sum test was applied, and ***p<0.0001 is different from all other groups.

The Figure 37 shows the knowledge levels on diseases causes in different groups; the disease causes for malaria, schistosomiasis/bilharziasis, ancylostomiases/hookworm and typhoid fever were asked for; the maximum score to obtain was 4 points.
The observed differences between EPP-IEC1 and EPP-IEC2 are not significant. IEC application has therefore not had an impact on children's knowledge during the first two years. After the third IEC application, there an increase on the score was observed (p<0.0001). The lowest score found here is in Plan1 group.
With part B, we can see that all EPP-IEC 1, 2 and 3 are at the average while the EPP-Plan group is still below the average; There is a significant difference between all EPP-IEC 1, 2 and 3 and EPP-Plan1 (p<0.0001)



Level				Mean
EPP-IEC3	A			2,36
EPP-IEC1		B		1,97
EPP-IEC2		B		1,96
EPP-Plan1			C	1,16

Figure 38. Knowledge scores on disease signs among the study groups are shown. In Part A the scores in all children (EPP-IEC1=219, EPP-IEC2=184, EPP-IEC=418, EPP-Plan1=2321) are given; in Fig.38, Part B from each study group n=184 children were randomly selected, are shown and compared. The Tukey Kramer test was applied (Part B) and if levels of the groups are not connected with the same letter the means are significantly different.

Figure 38. Shows an increase of knowledge level on disease taught signs from EPP-IEC1 group to EPP-IEC3 group with highest levels in groups EPP-IEC3 group. Significant low levels were observed in the EPP-Plan1 group when compared to EPP-IEC groups (P<0.0001)

In Part B, the level of knowledge about the disease signs taught to children gradually increases. The results showed that the lowest level of knowledge about diseases signs in all groups is EPP-Plan1 group with significant differences compared to all other groups (P<0.0001).

Total knowledge scores on disease cure/healing

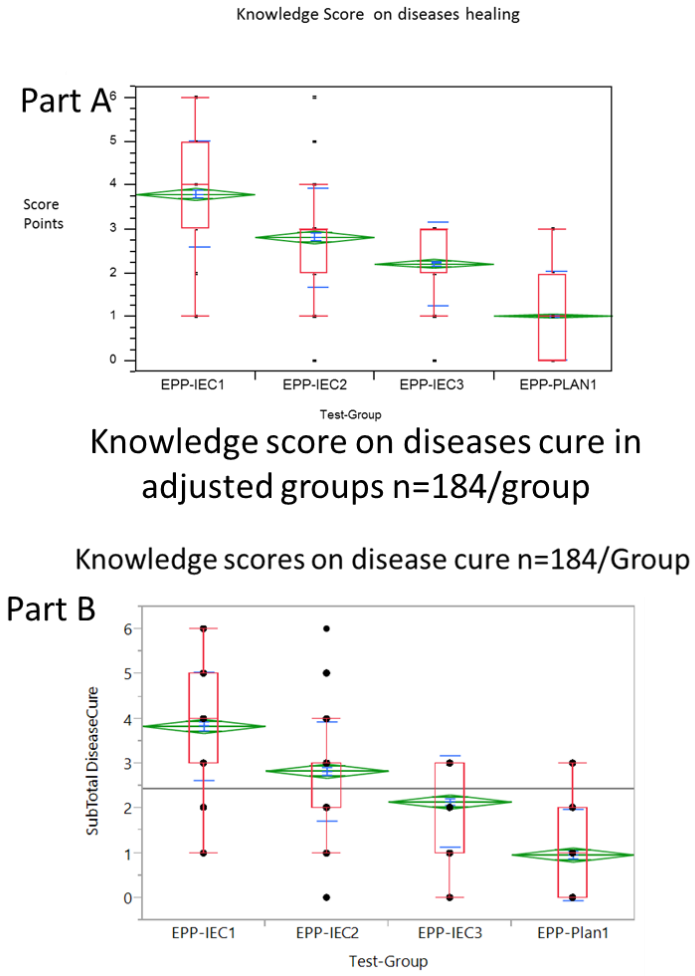


Figure 39. The comparison of children's knowledge on diseases cure is shown. In Part A the scores in all children (EPP-IEC1=219, EPP-IEC2=184, EPP-IEC=418, EPP-Plan1=2321) are given; in Figure 35, Part B from each study group n=184 children were randomly selected, are shown and compared.

There is a descent decrease from EPP-IEC1 group to EPP-IEC2 and EPP-IEC3 groups. Overall, the level of children's knowledge scores on taught disease healing in group EPP-Plan1 remains significantly low (*P<0.0001*).

Part B shows the analysis of knowledge on the healing of various diseases taught between balanced groups (184 children/group). The results showed that the highest level still in the EPP-IEC1 group and there is significant different compared to other groups (*P<0.0001*). Similar decrease trend was observed from EPP-Plan1 group to EPP-IEC3 as the overall comparison. However, EPP-Plan1 still is the lowest group.

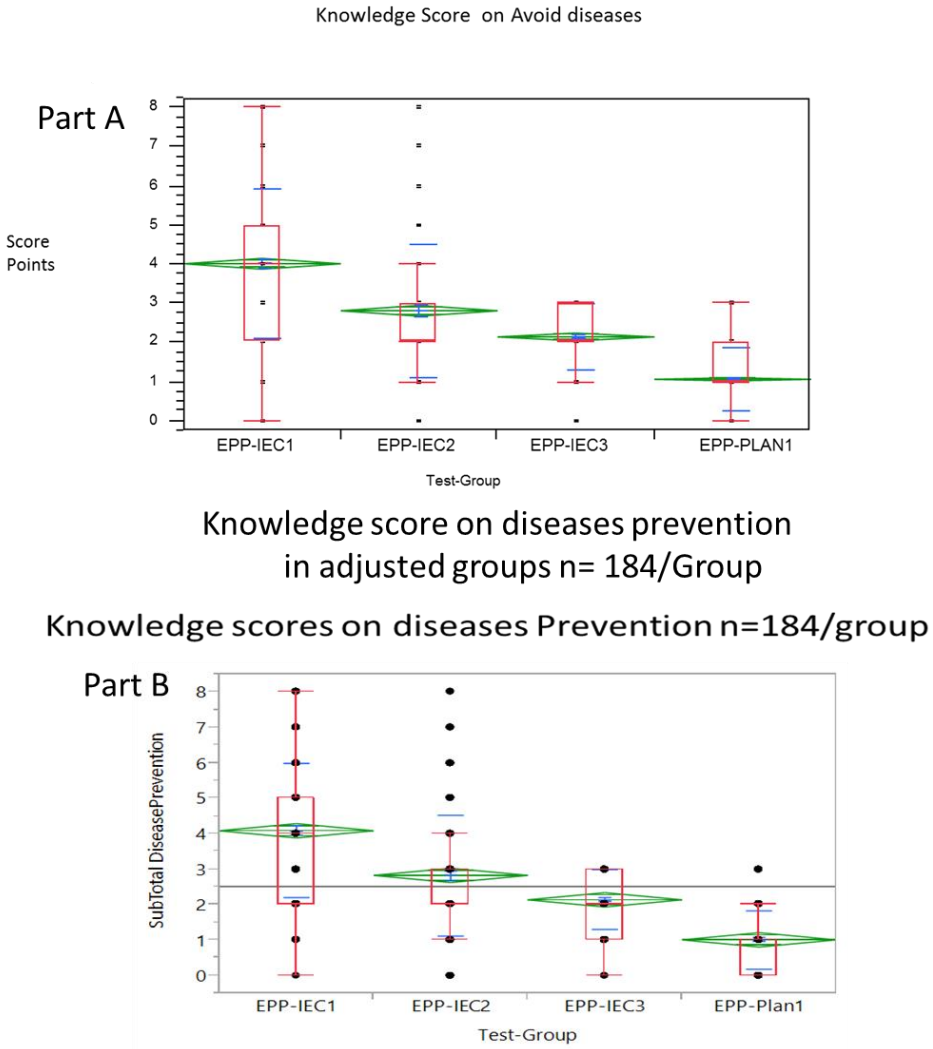


Figure 40. Total Knowledge scores on diseases prevention. In Part A the scores in all children (EPP-IEC1=219, EPP-IEC2=184, EPP-IEC=418, EPP-Plan1=2321) are given; in Figure 40, Part B from each study group n=184 children were randomly selected, are shown and compared

Figure 40. A (all children) and Figure 40. B (balanced groups) show the comparison of the knowledge on different diseases prevention. Similar date was observed in these two figures. There is a significant decrease from EPP-IEC1 group to EPP-IEC3 group (*P<0. 0001*). The EPP-Plan1 group still has the lowest knowledge score.

Figure 41. Knowledge score on vaccination

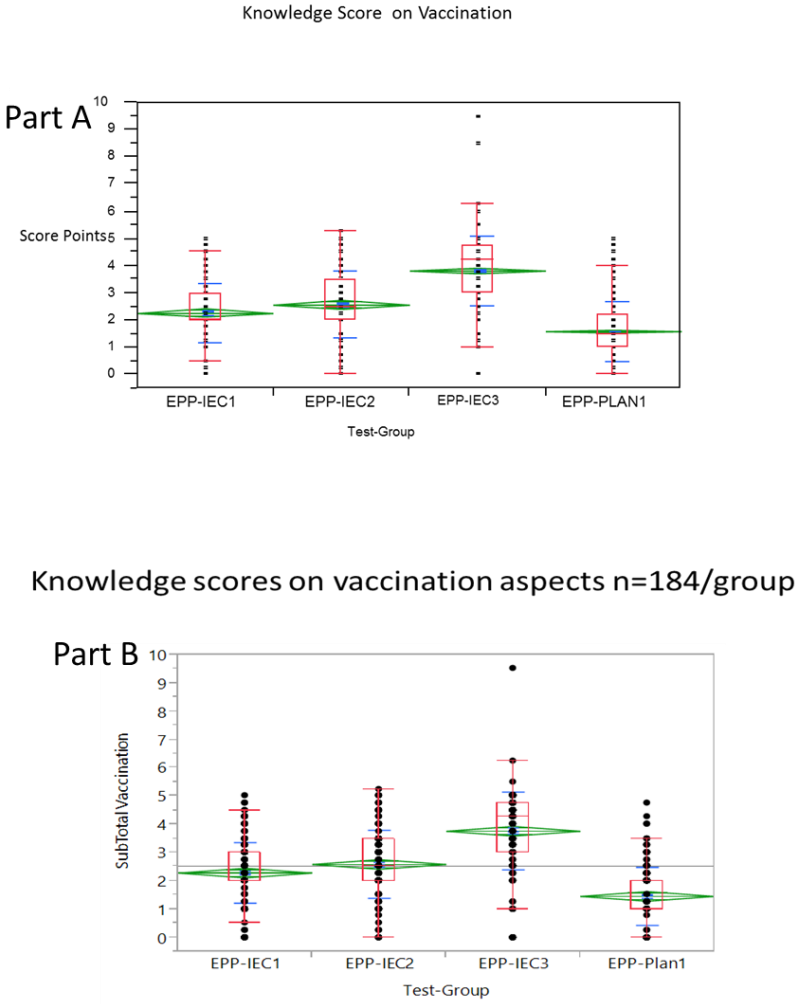


Figure 41. Shows the knowledge score on vaccination (against which disease, vaccination against TB/Polio). In Part A the scores in all children (EPP-IEC1=219, EPP-IEC2=184, EPP-IEC=418, EPP-Plan1=2321) are given; in Figure 41, Part B from each study group n=184 children were randomly selected, are shown and compared.

The scores in the EPP-IEC groups 1, 2 and 3 were higher than in the EPP-Plan 1 group. The EPP-IEC3 group scores were the highest compared to all other groups. At the beginning of this investigation, the EPP-IEC1 groups has low acquisition of knowledge about vaccination and its various aspects. With the repeated IEC sessions, the EPP-IEC3 group attained the highest knowledge scores. The difference between EPP-IEC3 and other groups is significant (*P<0.0001*). These figures also show that the level of knowledge in EPP-Plan1 group is significantly lower (*P<0.0001*).

Figure 42. Total knowledge scores on HIV/AIDS

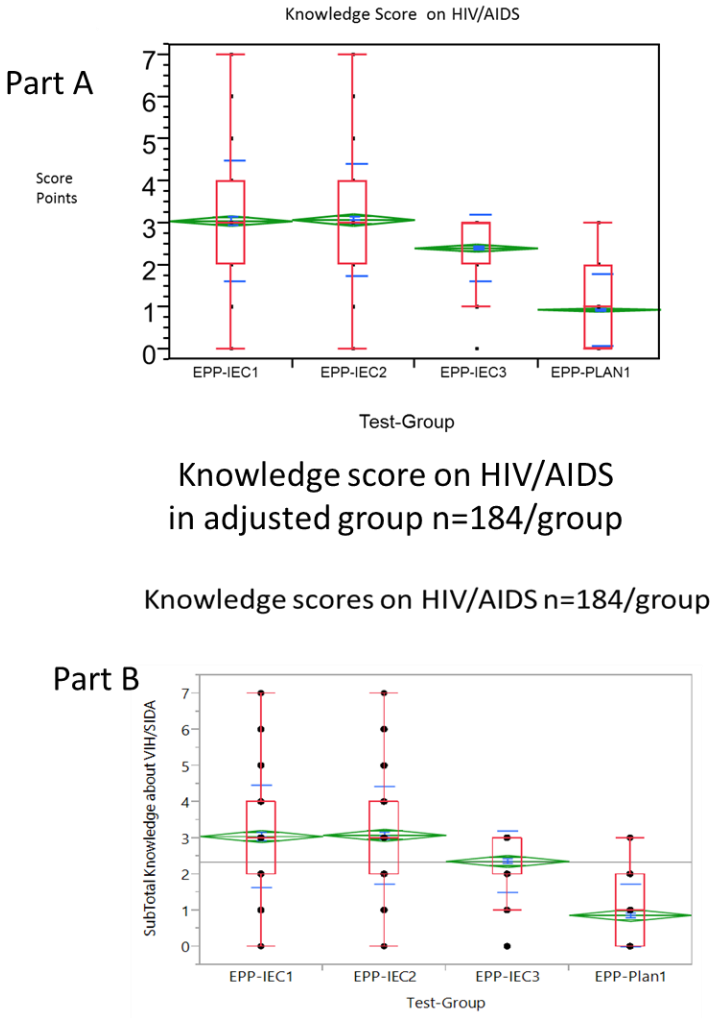


Figure 42. Analysis of the knowledge for HIV/AIDS between EPP-IEC1, 2, 3 and EPP-Plan1 is shown.In Part A the scores in all children (EPP-IEC1=219, EPP-IEC2=184, EPP-IEC=418, EPP-Plan1=2321) are given. In Part B from each study group n=184 children were randomly selected, are shown and compared.

Overall scores from all EPP-IEC groups were higher than those from EPP-Plan1 group. The similar high score were found in EPP-IEC1 and EPP-IEC2 groups. Comparing all EPP-IEC groups with EPP-Plan1 group, a significant low level were observed (*P<0,0001*).

Part B shows comparison in adjusted groups. The different between EPP-IEC groups and EPP-Plan1 group on the knowledge of HIV / AIDS and its various aspects is significant (*P<0.0001*).

Figure 43. Knowledge scores on hygiene application in school.

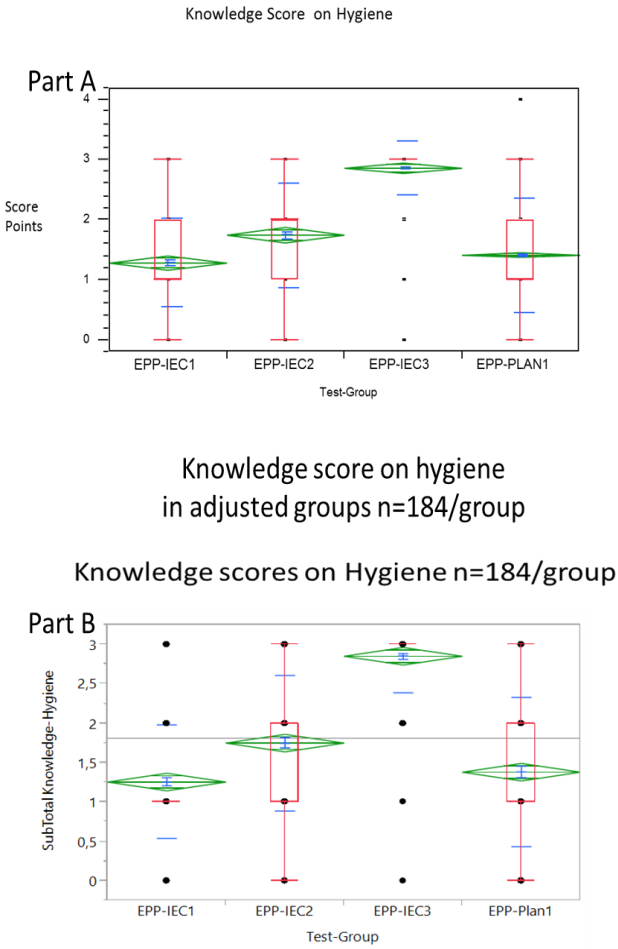


Figure 43. The knowledge scores on hygiene application in schools is shown.In Part A the scores in all children (EPP-IEC1=219, EPP-IEC2=184, EPP-IEC=418, EPP-Plan1=2321) are given; in Part B from each study group n=184 children were randomly selected, are shown and compared.

The knowledge score is increasing as the IEC session in EPP-IEC groups. The highest scores were found in EPP-IEC3 group. Figure 43. Part B showed the similar low scores were observed in EPP-IEC1 and EPP-Plan1 groups. EPP-IEC3 group is still the highest when compare with other groups (*P<0.0001*).

Figure 44. Total scores on the use of mosquito net

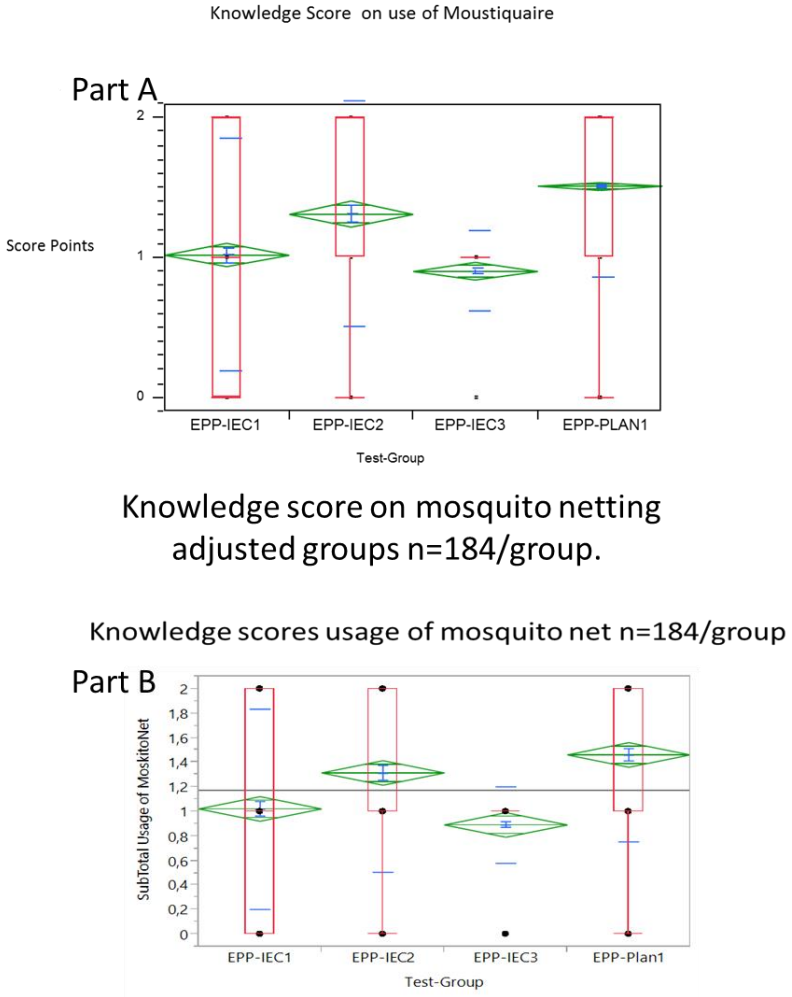


Figure 44. The level of mosquito net use at home is shown. In Part A the scores in all children (EPP-IEC1=219, EPP-IEC2=184, EPP-IEC=418, EPP-Plan1=2321) are given; in Part B from each study group n=184 children were randomly selected, are shown and compared.

Similar results are showed in EPP-IEC groups and the highest score was found in EPP-Plan1. Same results was observed in adjusted groups. There is a significant difference between EPP-Plan1 and EPP-IEC1; EPP-IEC3 (*P<0.0001*).

Figure 45. Absenteeism at school due to illness

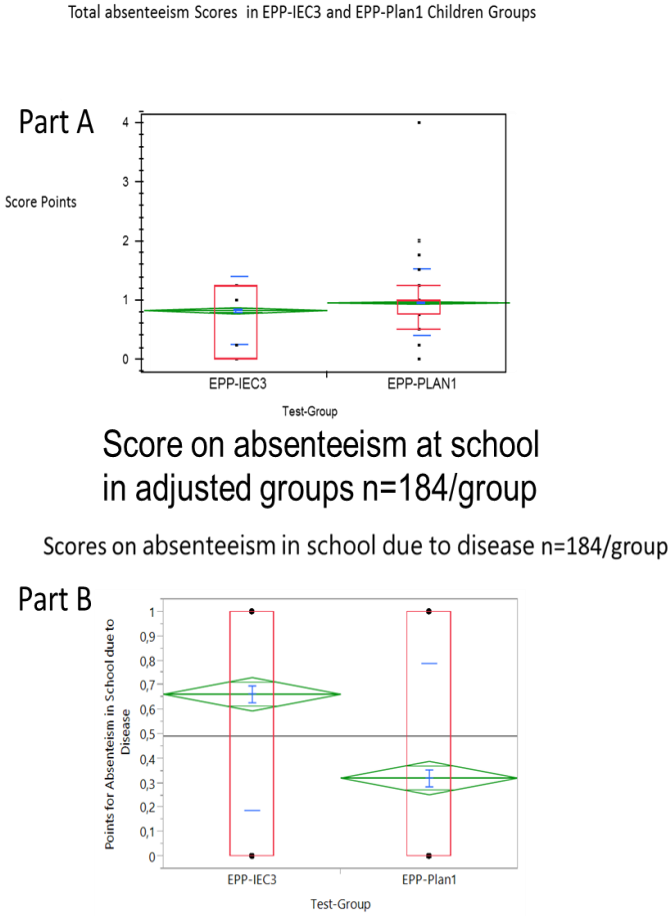


Figure 45. In Part A the school absenteeism due to illness is shown in EPP-IEC3 and EPP-Plan1 groups. Note that the comparison on the level of absenteeism at schools was only introduced in the EPP-IEC3 group, and this aspect was not considered in EPP-IEC1 and EPP-IEC2 groups at the very beginning.

Higher score was observed in EPP-Plan 1 group. Part B shows that children of EPP-IEC3 group are more frequent present at school compared to EPP-Plan1 group. The difference was significant ($P<0.0001$).

5.3 Correlations between health knowledge and the intensity ofhookworm infections and poly parasitism in public primary school children. The correlations shown are between mean values of parameters from n=32 schools.

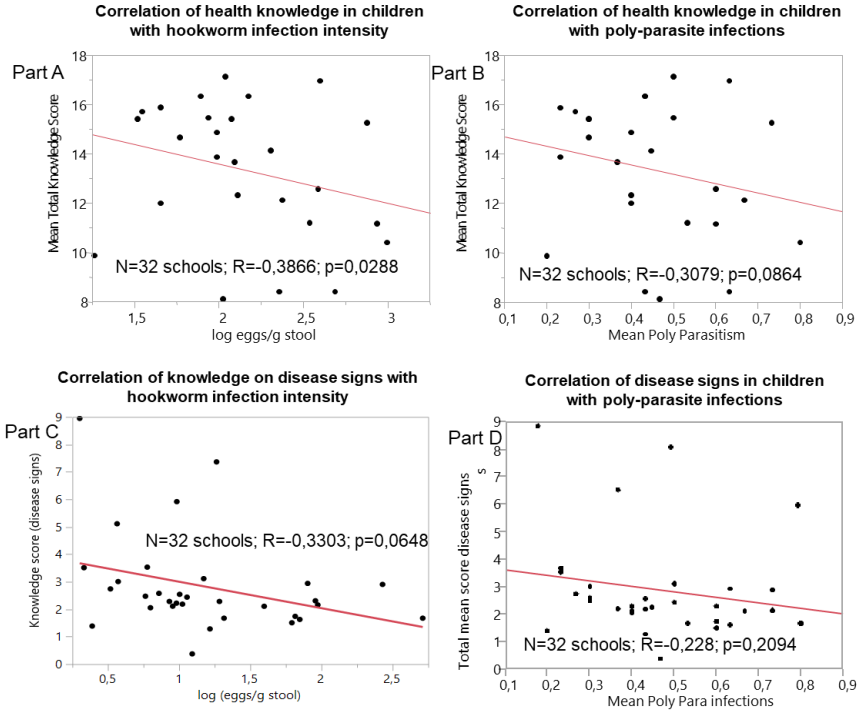


Figure 46. Correlation of total health knowledge and diseases' signs in EPP (all children were grouped by their school) with the intensity of hookworm infections and with the mean rate of poly parasitism. Part A shows the correlation between the total number of points obtained by EPP school children from all schools in relation to their knowledge of the different diseases taught by IEC (Hookworm, Ascariasis, Onchocerciasis, Malaria, HIV/AIDS, and Tuberculosis) and the intensity of hookworm infections in all schools. Part B shows the correlation between the knowledge on the different diseases concerned by IEC with the mean rate of poly parasite infection in all children. In Part C the correlation between recognition of certain disease signs (signs of malaria, schistosomiasis/bilharzias, intestinal worms, tuberculosis) with the intensity of hookworm infection rate in all children are shown. Part D shows the correlation between the recognition of disease signs with the mean poly parasitism in all children.

In Part A and B the total children knowledge, correlated negatively with the intensity of hookworm infections and with the rate of poly parasitismin schools (Part A (R=-,3866; p=0,0288) and part B (R=-0,3079; p=0,0864)). In part C the correlation did not show any significant dependency but correlated negatively with hookworm infections intensity (R=-0,3303; p=0,0648). The correlation in Part D indicates that good knowledge good scores on diseases signs associate negatively with a reduced rate of poly parasitism in schools (R=-0,228; p=0,2094). The analysis of the results in Figure 46 shows that better knowledge on different diseases and on diseases signs, could lower the intensity of Hookworm infections in children and poly parasitism in schools.

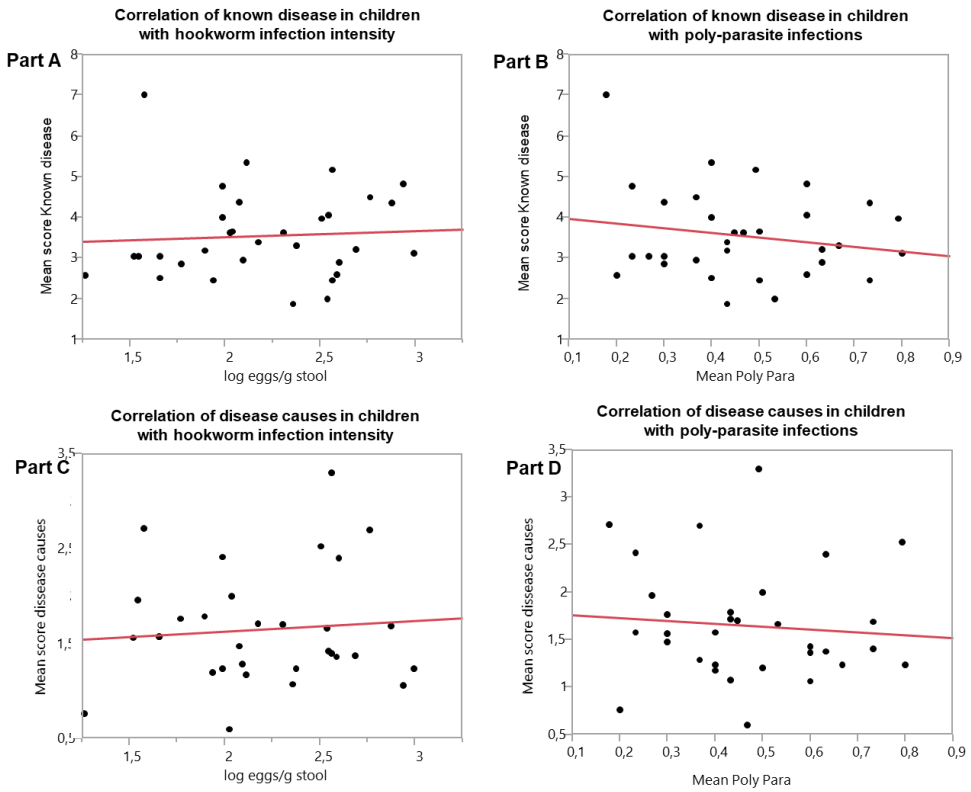


Figure 47. Correlation on known diseases and diseases causes in children, with the intensity of hookworm infection and with the of poly parasitism in schools

Figure 47 shows in Part A the correlation between the mean score on known diseases (malaria, hookworm, ascariasis, schistosomiasis, tuberculosis, and onchocerciasis, HIV/AIDS), with the intensity of infections with hookworm infection in all children groups is shown. Part B shows the correlation between the mean scores obtained by school children on disease recognition with the mean rate of poly-parasitism in schools. Part C presents the correlation between diseases causes recognition in children with intensity of hookworm infections. In part D the mean scores on diseases causes correlated with the mean poly parasitism rate in schools is shown.

In Figure 47 it is observed that school children's knowledge on diseases remain low. In Part A and part B the correlation on the knowledge scores on known diseases did not correlated with the intensity of hookworm infections in children and with poly parasitism in schools. The correlation in Part C and Part D did not disclosed any dependency.

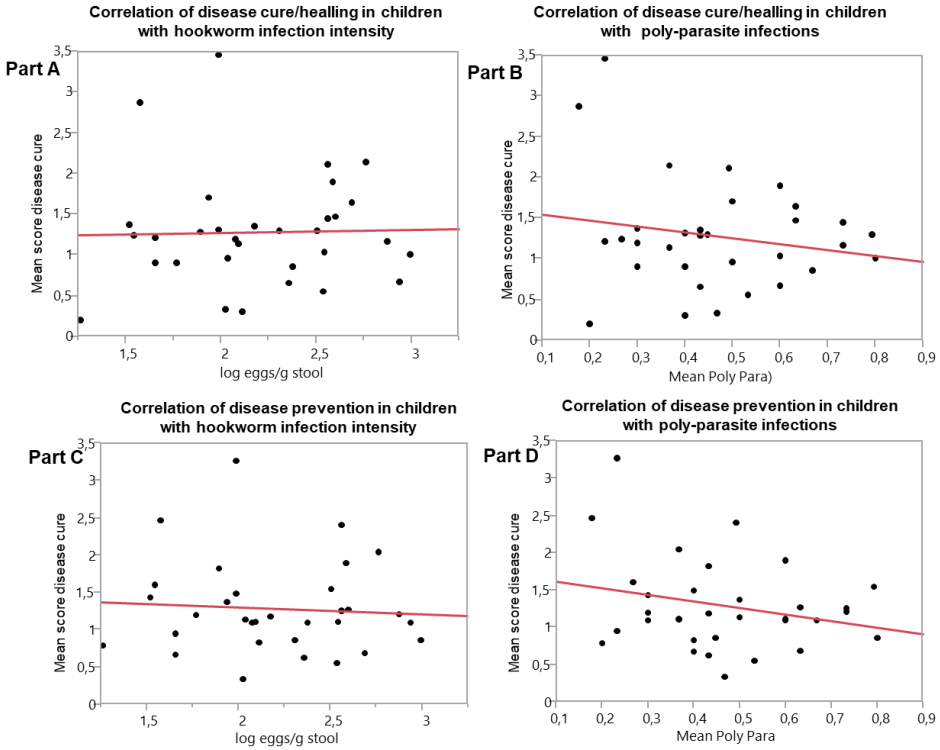


Figure 48. The knowledge about diseases cure and prevention in children correlated with the intensity of hookworm infections and with poly parasite infections is shown. In Part A the correlation between knowledge scores on how to cure certain diseases taught during IEC sessions (malaria, schistosomiasis, and worms in the stomach) with the intensity of hookworm infections. In Part B the correlation on how to cure certain diseases with the mean rate of poly parasitism. In Part C the correlation between knowledge scores on different modes of diseases prevention and the intensity of hookworm infection, and in Part D, the knowledge scores about prevention of common infections and the level of poly parasitism is shown.

In Part A and Part B the correlations did not show dependencies. In Part B it can be seen that the more school children know the modes of cure of diseases taught in IEC sessions the less cases of poly parasitism are encountered in schools. For Part C and D no dependencies has been seen but in Part D it can also be also seen that the higher the scores on diseases prevention the less poly parasitism is present in schools.

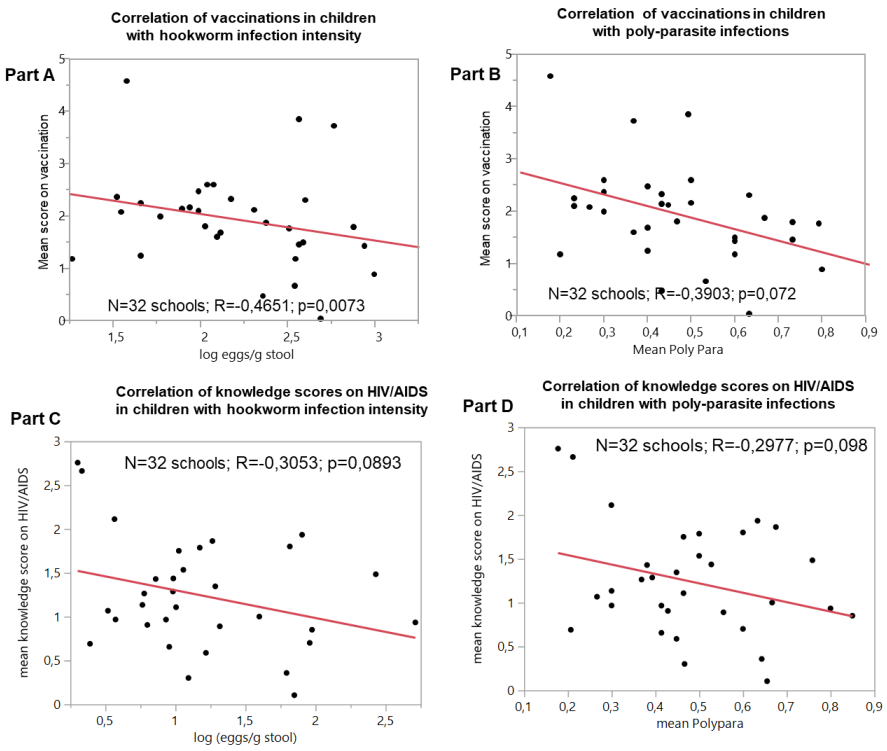


Figure 49. Correlation on knowledge scores on vaccination and HIV/AIDS with the intensity of hookworm infections and with poly parasitism in children.

Part A, shows the correlation between the scores obtained by school children on their knowledge about different aspects on vaccination (Why do you need to be vaccinated? Which vaccines do you know? Have you been vaccinated? How can you know that you are vaccinated against polio and tuberculosis?), with the intensity of hookworm infections in all schools. In Part B, the correlation is shown between the mean scores obtained by school children on different aspects of vaccination, with the mean rate of poly parasitism. In part C, the mean scores obtained by school children on their knowledge on various aspects of HIV/AIDS (Definition of the disease called HIV/AIDS. How can someone get this disease? How to avoid this disease?) With the intensity of hookworm infections.Part D shows the correlation between the mean scores obtained by children on their knowledge about the different aspects of HIV/AIDS with the mean rate of poly parasitism in all children.

The correlation in part A indicates that good knowledge scores on vaccination aspects associate with a reduced intensity of hookworm infections in schools (R=-0,4651; p=0,0073). The analysis in Part B, shows a significant negative correlation (R=-0,3903; p=0,072) on knowledge in children on the aspects of vaccination and poly parasitism in EPP. In Part C, no significant difference has been observed. This shows that children's knowledge about HIV/AIDS is still low. Comparing the mean score on knowledge on HIV/AIDS and the mean poly parasitism in all children, no significant dependency was found (R=-0,2977; p=0,098).

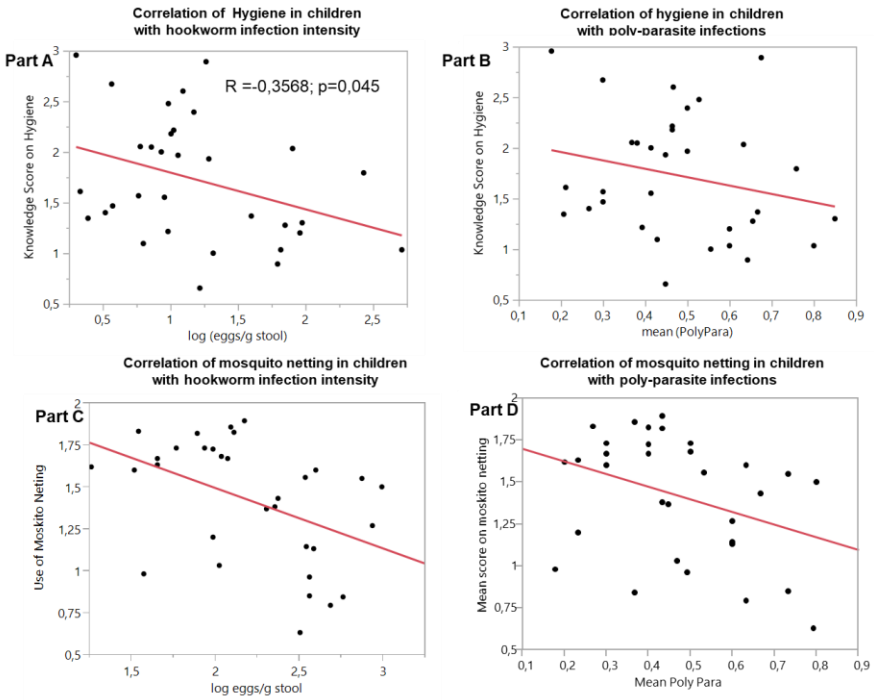


Figure 50. Correlation on hygiene and mosquito netting in EPP children (grouped by schools, n=32) with the intensity of hookworm and with poly parasite infections

Figure 50 shows in Part A the correlation between the knowledge scores obtained by schools on hygiene aspects (Why washing hands before eating? How to prevent parasitic infections? Is it necessary to wash fruits before eating them? Etc.), with the intensity of hookworm infections. In Part B the correlation between the mean scores obtained by schools on their knowledge about hygiene aspects with the mean rate of poly parasitism in schools. In Part C, the correlation between the mean scores obtained by schools on the use of mosquito nets at home (Do you have a mosquito net at home? Do you sleep under a mosquito net at home?) with the intensity of hookworm infections, and in Part D, the correlation is between the use of mosquito nets at home with the mean rate of poly parasitism is shown.

In Figure 50 the correlation of the knowledge scores on hygiene with hookworm infection intensity disclosed significant dependency (R=-0,3568; p=0,045). This may means that the practices of personal hygiene can reduce the intensity of hookworm infections in schools. Equally, the practice of hygiene may lessen cases of poly parasitism in schools. In Part C and D, it can also be seen that the more children sleep under mosquito netting, the lower the intensities of hookworm infections (Part C) and the regular use of mosquito netting associated with reduced poly parasitism in schools (Part D).

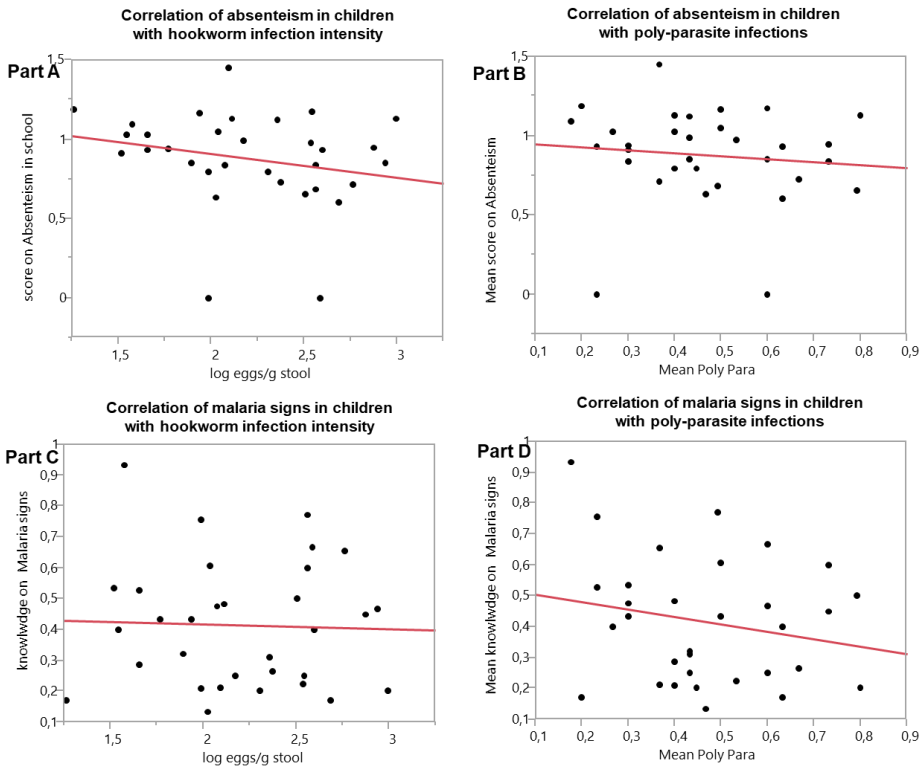


Figure 51. Correlation on absenteeism and malaria signs with the intensity of hookworm infections and with poly parasite infections in children

In Part A of Figure 51, the correlation between absenteeism among school children grouped by schools (Have you been you absent from school because of a disease? How often have you been absent?), with the intensity of hookworm infections is shown. In Part B, the dependency between absenteeism among children from all schools with the mean rate of poly parasitism is shown. Part C shows the correlation between knowledge scores on recognition of malaria signs (What are the signs of malaria), with the intensity of hookworm infections in all schools. In Part D, the correlation between children's recognition of malaria signs, with the mean rate of poly parasitism is given.

It can be seen in Figure 51. Part A, that the more children are absent from school, the lower the intensity of hookworm infections. For part B, the same observation is found as in part A. In Figure 51. Part C the knowledge scores on malaria signs did not associate with the intensity of hookworm infections. The correlations in Fig. 51 Part D disclose that the higher the knowledge scores on malaria signs, the lower the rate of poly parasite infections were encountred in schools. This would mean that the higher the children's scores on recognition of malaria signs, the less the cases of poly parasitism rates are encountered in schools.

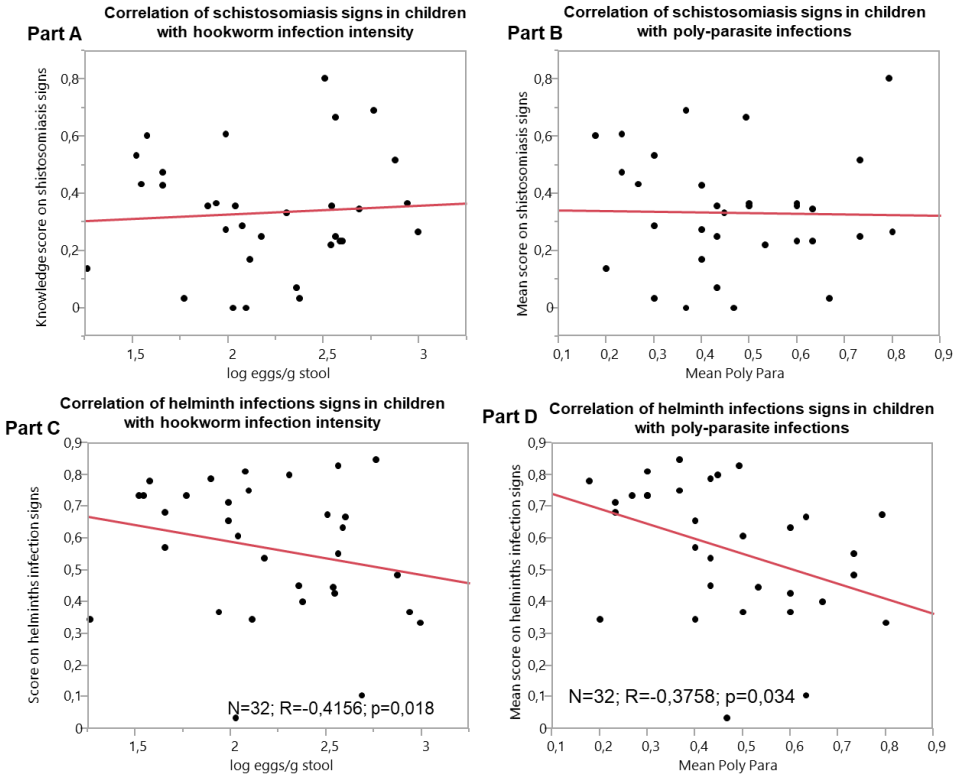


Figure 52. Correlation on schistosomiasis and helminths infection signs with the intensity of hookworm infections and with the mean rate of poly parasitism in schools

Figure 52. Part A shows the correlation between the knowledge scores of school children on schistosomiasis signs (What are the signs of schistosomiasis?) with the intensity of hookworm infections in schools. Part B shows the correlation between the mean knowledge score obtained by school children on schistosomiasis signs with the mean rate of poly parasitism. Part C shows the correlation between the knowledge score of school children on helminth infections signs (Checking correctly answers to the question what are the signs of helminths infections.) with the intensity of hookworm infections in all schools, and Part D with the mean rate of poly parasitism in children.

In Figure 52 it is observed that children's knowledge scores on schistosomiasis signs remains low. In Part A and B, the knowledge on schistosomiasis signs did not correlate with the intensity of hookworm infections and with poly parasitism in schools, while in Parts C and D recognition of helminthes infections signs were significantly associated with the intensity of hookworm infections (R=-0,4156; p=0,018) and with the rate of poly parasitism in schools (R=-0,3758; p=0,034). For this analysis, it can then be concluded that, by improving school children's knowledge on the symptoms of helminth infections, this can reduce the intensity of parasite infections in children and, in consequence, reduce poly parasitism in schools.

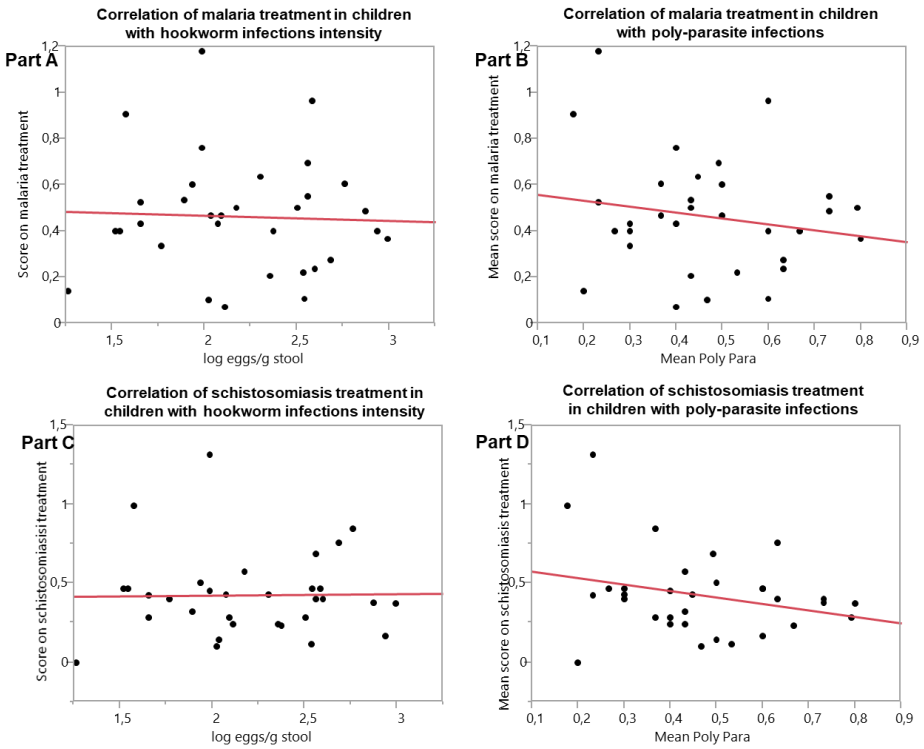


Figure 53. Correlation on malaria and schistosomiasis treatment knowledge with the intensity of hookworm infections and poly parasite infections in schools

Figure 53. Part A and C shows the correlations between the mean knowledge score of school children on malaria/schistosomiasis treatment in the questionnaire (By checking the correct answers to the question how malaria/schistosomiasis can be cured.) with the intensity of hookworm infections. In Part B and D, the correlations between the mean knowledge scores on the same question with the mean rate of poly parasite infections.

In Figure 53, significant dependencies were not seen. But with the associations of the knowledge scores on malaria and shistosomiasis treatment with hookworm infection and with the rate of poly parasitism in schools, it can be seen that the higher the knowledge about curative treatment of malaria and schistosomiasis associated with the reduce polyparasitism infection (Part B) and (Part D). Thus, for children, by improving their knowledge on malaria and schistosomiasis treatment, can lower the poly parasitism rate in schools. Therefore, children's education on malaria and schistosomiasis treatment should be intensified, this could potentially reduce the intensity of hookworm infection and the poly parasitism in schools.

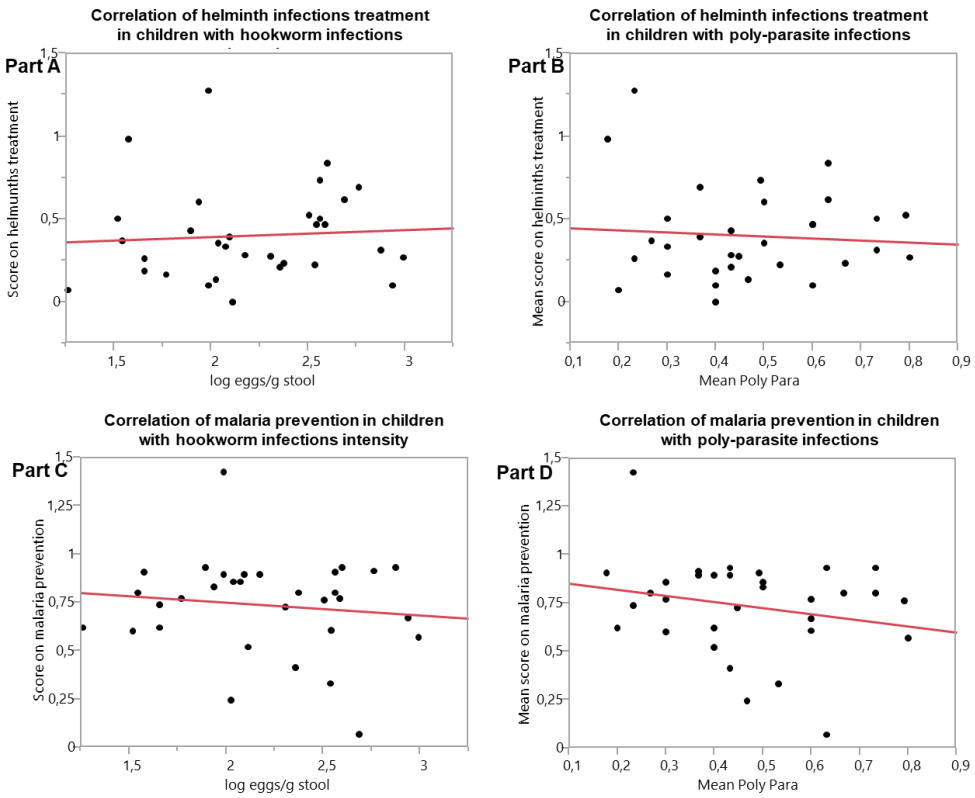


Figure 54. Correlation on helminth infection treatments and malaria prevention with the intensity of hookworm infections and poly parasite infections in schools.

In Figure 54. Part A shows the correlation between the knowledge score on helminth infections treatment (How can helminth infections be cured?), with the intensity of hookworm infections in children, and in Part B the correlation with mean poly parasitism. In Part C and D, the correlation between knowledge scores on malaria prevention (How can we avoid malaria?), with the intensity of hookworm infections and with the mean rate of poly parasitism in schools is shown.

For the correlations presented in Figure 54. Helminths treatments options and malaria prevention options did not associate neither with helminth infections intensity nor rate of poly parasitism. That means that, IEC sessions on methods how to treat intestinal helminth infections should be strengthened in schools which may help to reduce intensity of hookworm infections and the rate of poly parasitism among school children.

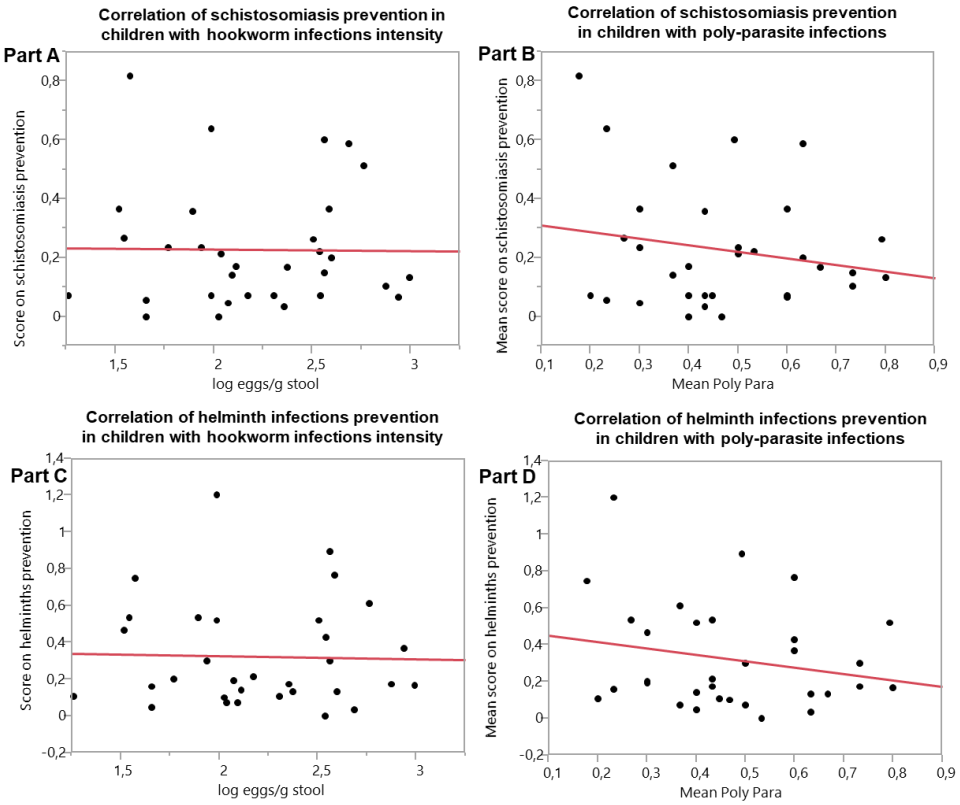


Figure 55. Correlation on how to prevent schistosomiasis and intestinal helminth infections with the intensity of hookworm infections and poly parasitism in schools

Figure 55. Part A and B, presents the correlation between the knowledge score of school children on the prevention of schistosomiasis (correct answer how to avoid schistosomiasis) with the intensity of hookworm infections and poly parasitism in all school. In Part C and D, the correlation between the knowledge scores on prevention of helminths infections (by checking the correct answer to the question how to avoid helminths infections) with the intensity of hookworm infections and the mean rate of poly parasitism in schools is shown.

In Figure 55 it may be seen that knowledge on prevention of schistosomiasis and intestinal helminth infection did not effect on intensity of parasite load and the rates of poly parasitism in Part A and Part B. For this aspects presented in fig. 55, there is a need to intensify IEC sessions on children's knowledge on schistosomiasis and intestinal helminth infections, this could help to reduce poly parasitism rate of in schools and the intensity of hookworm infections in children.

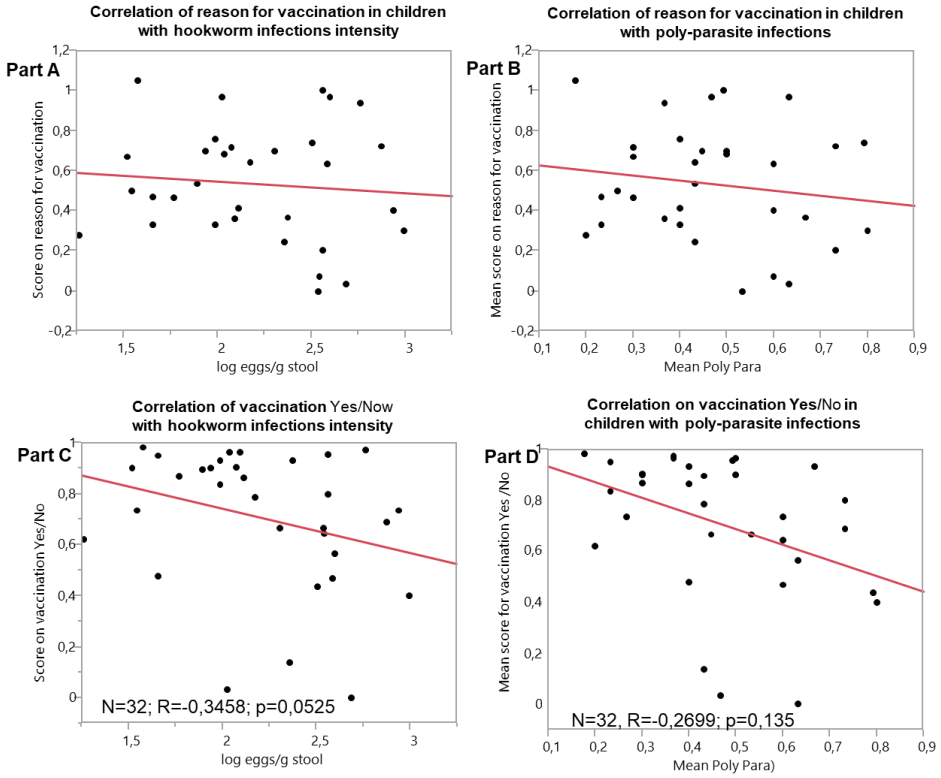


Figure 56. Correlation on reasons for vaccination and vaccination Yes/No with the intensity of hookworm infections and with poly parasite infections in schools. Part A shows the correlation between the knowledge score on the reasons for vaccination (Why is it necessary to be vaccinated?), with the intensity of hookworm in children. Part B shows the correlation between known reasons for vaccination with the mean rate of poly parasite infections in children, Part C and D the correlation between ("Have you been vaccinated?" Yes or No) with the intensity of hookworm infection and poly parasitism in children.

In Figure 56. Regarding the knowledge score in Part A and questions on vaccinations issues, the correlations did not show significant dependencies. Clearly correlated in fig.56 were vaccination (Yes/No) with the intensity of hookworm infections in Part C (R=-0,3458; p=0,0525) and with poly parasitism in schools in Part D (R=-0,2699; p=0,135). For this we can say that, by improving school children knowledge on the importance of vaccination can help to reduce the intensity of intestinal helminth infections and reduce rate of poly parasitism in schools as well.

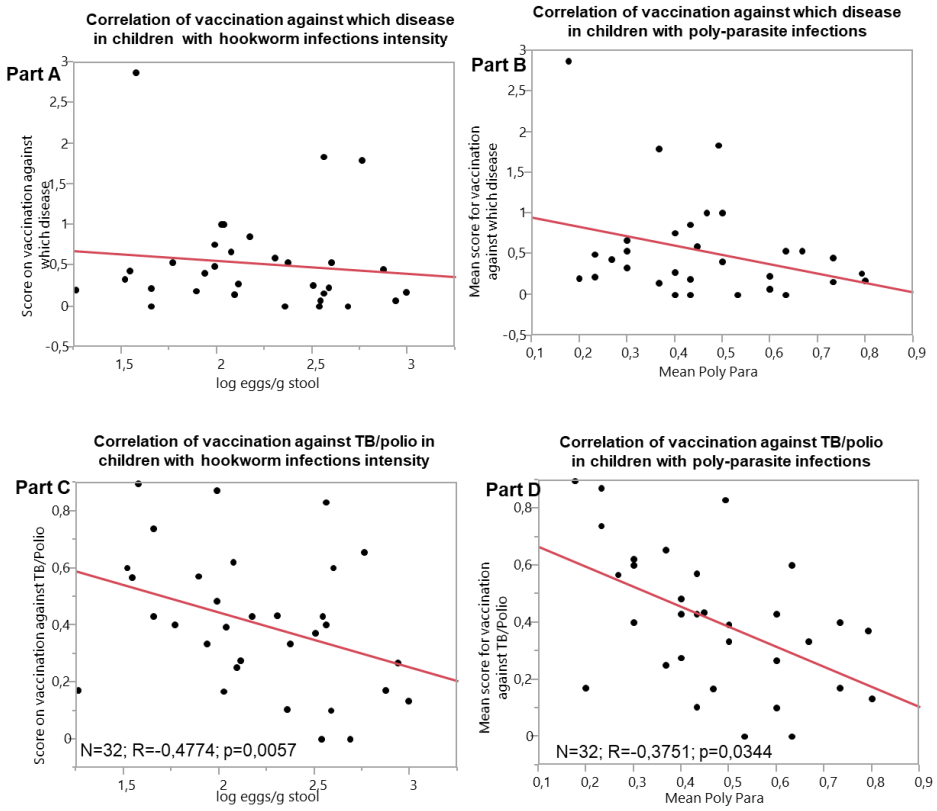


Figure 57. Correlation on the number of vaccination received (against which disease), the vaccination against TB/Polio with the intensity of hookworm infections and poly parasite infections in schools.

In Figure 57 the correlation between the knowledge score (on the question: Against which diseases have you been vaccinated?) with the intensity of hookworm infections (Part A), and in Part B with the mean of poly parasitism in schools is shown. In Part C the knowledge scores obtained for vaccinations against TB and Polio (How can you know that you have been vaccinated against TB and polio?) are correlated with the intensity of hookworm infection and with the mean rate of poly parasite infections (Part D) in schools.

In fig. 57, the knowledge about specific vaccinations they received did not correlate with hookworm infection intensity and with poly parasitism in schools. Clearly correlated in fig.57 were vaccination against TB/polio with the intensity of hookworm infections in Part C (R=-0,4774; p=0,0057) and with the rate of poly parasitism in schools in Part D (R=-0,3751; p=0,0344).

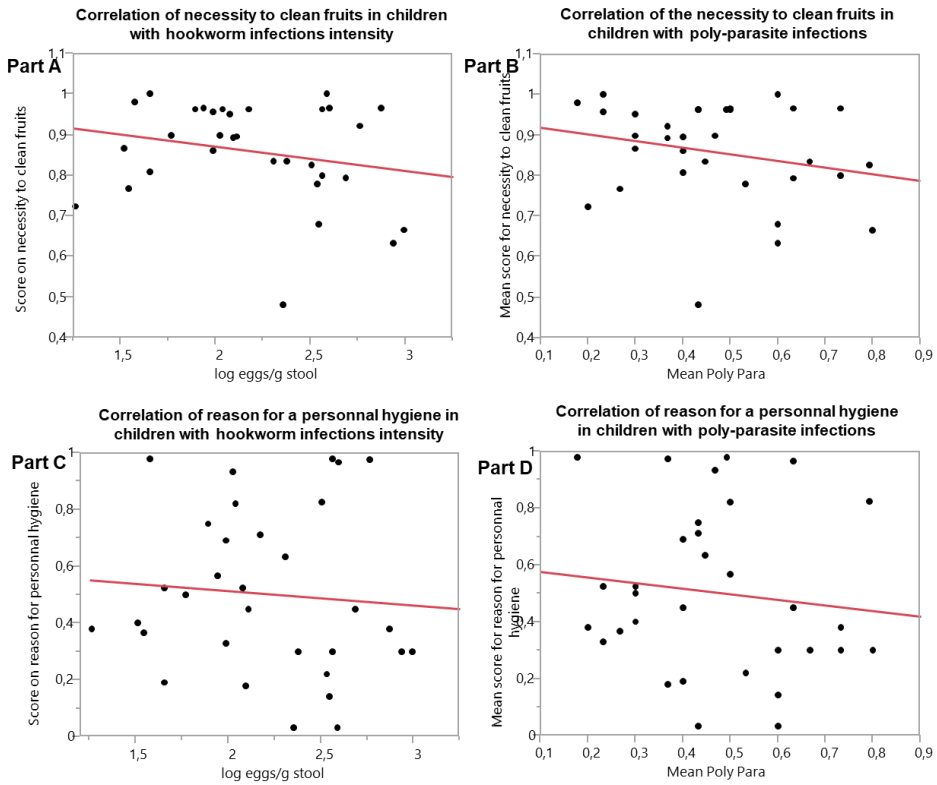


Figure 58. Correlation on the necessity to clean fruits before consumption and on the reasons for personal hygiene with the intensity of hookworm infections and with the poly parasite infections in schools

Part A is presenting the correlation between scores on hygiene practice (Is it necessary to wash the fruits before eating them?) with hookworm infections intensity, and Part B shows the correlation between food hygiene practice with poly parasitism in schools. The correlation shown in part C and D is between the reasons for personal hygiene (Why is it necessary to be clean?) with the intensity of hookworm infections and with the mean rate of poly parasitism.

The correlations related to food and personal hygiene did not show significant dependencies with the intensity of hookworm infections and poly parasitism in schools, thus there is a need to intensify IEC sessions on children's knowledge about food and personal hygiene, this could help to reduce poly parasitism rate of in schools and the intensity of hookworm infections in children.

Table 12.

Paired correlation on knowledge of the bloody urines and vomiting in all children groups with the intensity of hookworm infections and the mean rate of poly parasitism in schools.

Part A

Variable 1	Variable 2	Correlation R	n examined	95% lower CI	95% upper CI	p value
Known Reason for Bloody Urine	eggs/10 ml urine	0,0187	1160	-0,0389	0,0762	0,5244
Known Reason for Bloody Urine	log eggs/g stool	0,0274	1643	-0,0209	0,0757	0,2663
Known Reason for Bloody Urine	PolyPara	0,0538	2010	0,0101	0,0973	0,0159
Known Reason for Bloody Urine	Age	0,1378	1540	0,0885	0,1865	<,0001
PolyPara	eggs/10 ml urine	0,3134	1160	0,2605	0,3644	<,0001
log eggs/g stool	eggs/10 ml urine	0,1022	873	0,0361	0,1674	0,0025
Age	eggs/10 ml urine	-0,0389	702	-0,1126	0,0352	0,3034
Age	log eggs/g stool	-0,0481	1346	-0,1012	0,0054	0,0779
Age	PolyPara	-0,0397	1540	-0,0895	0,0103	0,1196

Part B

Variable 1	Variable 2	Correlation R	n examined	95% lower CI	95% upper CI	p value
Known Reason for Vomiting	log eggs/g stool	-0,2535	32	-0,5533	0,1044	0,1615
Known Reason for Vomiting	eggs/10 ml urine	-0,112	5	-0,9049	0,8547	0,8577
Known Reason for Vomiting	PolyPara	-0,1415	32	-0,4671	0,218	0,4399
Known Reason for Vomiting	Age	0,3375	31	-0,0191	0,618	0,0633
PolyPara	Age	0,0954	31	-0,268	0,435	0,6097
log eggs/g stool	eggs/10 ml urine	0,484	5	-0,695	0,9574	0,4087
log eggs/g stool	Age	0,0754	31	-0,2866	0,4186	0,6869
eggs/10 ml urine	PolyPara	0,4938	5	-0,6884	0,9585	0,3979
eggs/10 ml urine	Age	0,4377	4	-0,9034	0,9846	0,5623

In Part A, the correlation between the reasons for bloody urine (A boy urines since days with blood, what disease he suffers?) with the intensity of hookworm infections in all children groups and with the mean rate of poly parasite infection in schools is shown. In Part B, the correlation between reasons for vomiting with the intensity of

hookworm infections in all children groups and with the mean rate of poly parasite infection in schools is presented.
In this table, the symptoms associated with schistosomiasis and helminths infections are linked with the intensity of hookworm infections in all children groups and with the mean rate of poly parasite infection in schools. While the signs of bloody urine and vomiting did not show significant dependencies with infection parameters (intensity, poly parasitism), the sign of urinary schistosomiasis (blood in urine) was associated with the age of school children. There is therefore a need to improve school children's knowledge on these aspects.

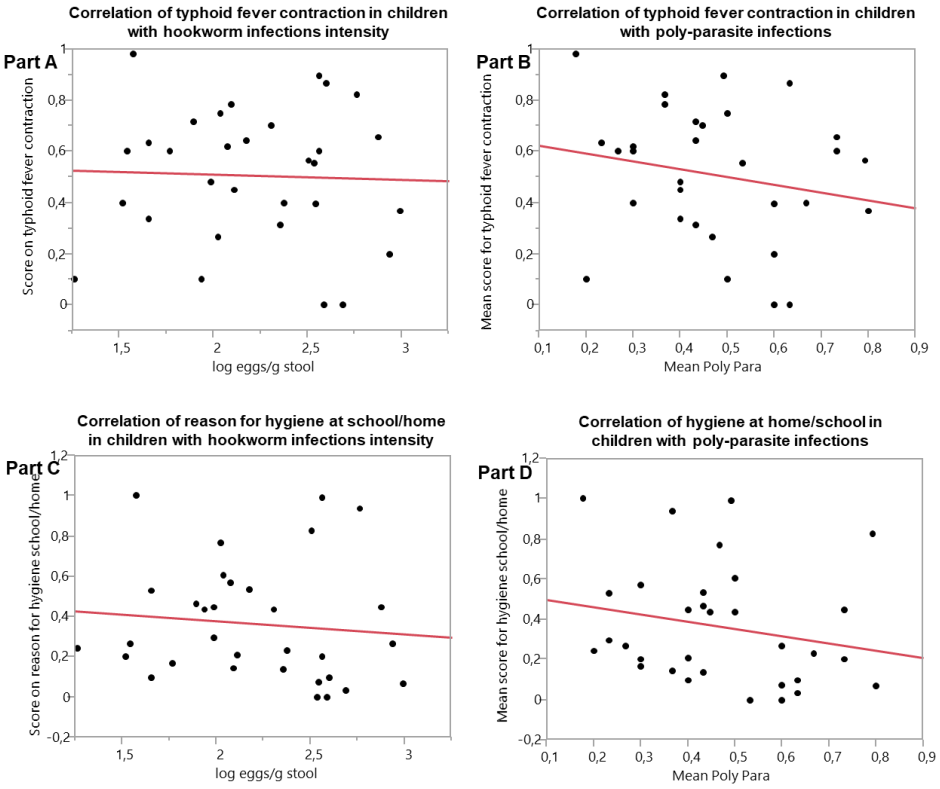


Figure 59. Correlation on typhoid fever contraction and on hygiene measures at school and home with intensity of hookworm infections and rate of poly parasite infection in schools.
In Part A and B the correlation is between knowledge on transmission of typhoid fever (How can someone contract typhoid fever?) with hookworm infection intensity and mean rate of poly parasite infections in all schools. In part C and D, the necessity for hygiene practice at home and at school. (Why should you always sweep your house or classroom?), is in correlation with intensity of hookworm infections and the mean rate of poly parasite infections in schools.
For this figure, it should be noted that IEC on typhoid fever have been introduced during the third year of this study (IEC3). The knowledge on typhoid fever contraction had not improved yet. Association of the knowledge on typhoid fever with hookworm infection and with poly parasitism did not show dependencies. In part C and part D, correlation of reason for hygiene at school/home with hookworm infection and with less poly parasitism no significant dependency was seen. Notions on typhoid fever and hygiene practices at school and at home should be reinforced during the IEC

sessions in order to help school children to improve their knowledge on these health.

Variable 1	Variable 2	Correlation R	n examined	95% lower CI	95% upper CI	p value
Known Reason for Diarrhea	eggs/10 ml urine	-0,0941	5	-0,9015	0,8595	0,8804
Known Reason for Diarrhea	log eggs/g stool	-0,2167	32	-0,5257	0,1428	0,2336
Known Reason for Diarrhea	PolyPara	-0,1071	32	-0,4394	0,251	0,5597
Known Reason for Diarrhea	Age	0,3149	31	-0,0444	0,6021	0,0844
PolyPara	Age	0,0954	31	-0,268	0,435	0,6097
log eggs/g stool	Age	0,0754	31	-0,2866	0,4186	0,6869
eggs/10 ml urine	log eggs/g stool	0,4855	5	-0,6941	0,9576	0,4071
eggs/10 ml urine	PolyPara	0,4952	5	-0,6874	0,9586	0,3963
eggs/10 ml urine	Age	0,4371	4	-0,9036	0,9846	0,5629

Part B

Variable 1	Variable 2	Correlation R	n examined	95% lower CI	95% upper CI	p value
Known Reason for Coughing	eggs/10 ml urine	-0,0436	5	-0,8916	0,8722	0,9445
Known Reason for Coughing	log eggs/g stool	-0,2772	32	-0,5707	0,0792	0,1246
Known Reason for Coughing	PolyPara	-0,1765	32	-0,4947	0,1835	0,3339
Known Reason for Coughing	Age	0,3665	31	0,014	0,638	0,0426
PolyPara	Age	0,0954	31	-0,268	0,435	0,6097
log eggs/g stool	Age	0,0754	31	-0,2866	0,4186	0,6869
eggs/10 ml urine	log eggs/g stool	0,484	5	-0,695	0,9574	0,4087
eggs/10 ml urine	PolyPara	0,4938	5	-0,6884	0,9585	0,3979
eggs/10 ml urine	Age	0,4377	4	-0,9034	0,9846	0,5623

Aspects.

Part A

Table 13.

Correlations on reason for diarrhea and coughing with the intensity of hookworm infections in all children groups and with the mean rate of poly parasite infections in schools.

Upper Panel shows the correlations on the reasons for diarrhea (A child has diarrhea, what disease does he suffer? Answer with your own words) with the intensity of hookworm infection, and with the mean rate of poly parasite infections in schools.

In the lower Panel the correlations between reasons for coughing (A girl has been coughing for 2 weeks, what is she suffering from?) with the intensity of hookworm infections and with the mean poly parasite infections rate in schools is shown.

For these 4 correlations no significant associations have been observed. Therefore, lessons on the causes of diarrhea and tuberculosis need to be strengthened during IEC sessions to enable children to improve their knowledge in order to avoid these diseases.

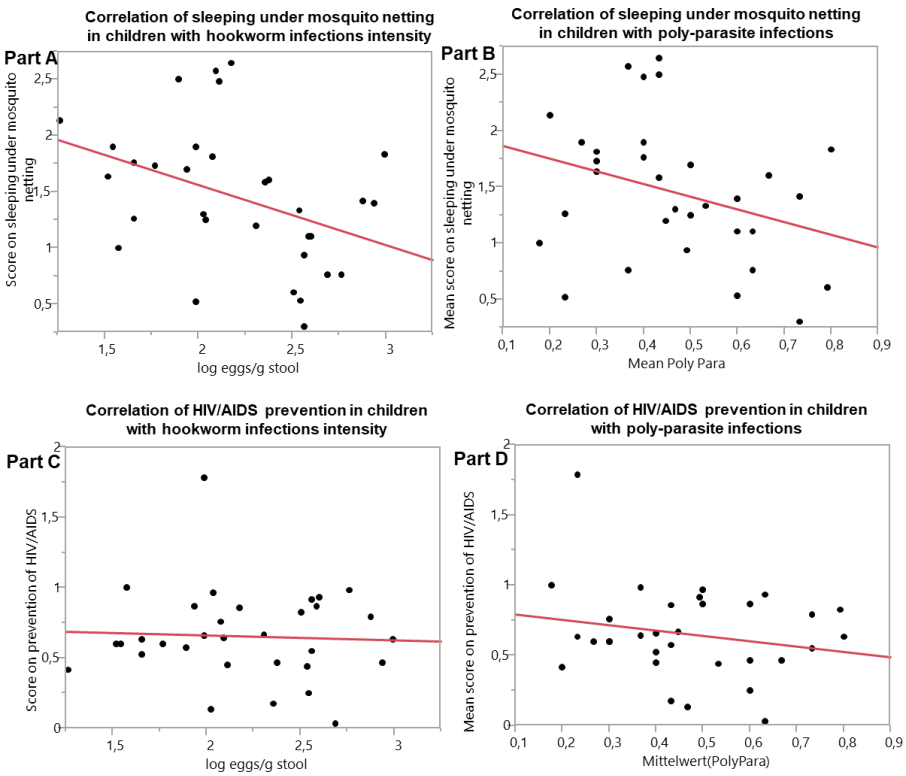


Figure 60. Association between the sleeping under mosquito netting and the knowledge of HIV/AIDS prevention with the intensity of hookworm infections and with the mean rate of poly parasite infections in schools.
Part A and B show the correlation between sleeping under mosquito netting (Do you sleep under a mosquito net?) and the intensity of hookworm infections and with the mean rate of poly parasite infection in schools. In part C and D the knowledge score on HIV/AIDS prevention (How to avoid HIV/AIDS?) is correlated with the intensity of hookworm infections the mean rate of poly parasite infections in all schools.
Sleeping under mosquito netting is correlated with reduced hookworm infection intensities and poly parasite infection in schools. It should be noted that in Part C, the knowledge on HIV/AIDS prevention did not show any association with the intensity of hookworm infections, but in those children with an heightened HIV/AIDS knowledge poly parasite infections were less frequent (Part D) These results show that good use of mosquito nets already by school can also help to reduce the intensity of hookworm infections and to lower poly parasitism rates in schools.

Part A

Variable 1	Variable 2	Correlation R	n examined	95% lower CI	95% upper CI	p value
Contraction of HIV/SIDA	eggs/10 ml urine	-0,1309	5	-0,9083	0,8495	0,8338
Contraction of HIV/SIDA	log eggs/g stool	-0,2364	32	-0,5405	0,1224	0,1927
Contraction of HIV/SIDA	PolyPara	-0,2363	32	-0,5405	0,1225	0,1929
Contraction of HIV/SIDA	Age	0,4229	31	0,0806	0,6759	0,0178
eggs/10 ml urine	log eggs/g stool	0,4855	5	-0,6941	0,9576	0,4071
eggs/10 ml urine	PolyPara	0,4952	5	-0,6874	0,9586	0,3963
eggs/10 ml urine	Age	0,4371	4	-0,9036	0,9846	0,5629
log eggs/g stool	Age	0,0754	31	-0,2866	0,4186	0,6869
PolyPara	Age	0,0954	31	-0,268	0,435	0,6097

Part B

Variable 1	Variable 2	Correlation R	n examined	95% lower CI	95% upper CI	p value
Definition HIV+SIDA	eggs/10 ml urine	-0,1657	5	-0,9143	0,8393	0,7901
Definition HIV+SIDA	log eggs/g stool	-0,2628	32	-0,5602	0,0946	0,1462
Definition HIV+SIDA	PolyPara	-0,2498	32	-0,5506	0,1083	0,1679
Definition HIV+SIDA	Age	0,2362	31	-0,1289	0,545	0,2007
eggs/10 ml urine	log eggs/g stool	0,4855	5	-0,6941	0,9576	0,4071
eggs/10 ml urine	PolyPara	0,4952	5	-0,6874	0,9586	0,3963
eggs/10 ml urine	Age	0,4371	4	-0,9036	0,9846	0,5629
log eggs/g stool	Age	0,0754	31	-0,2866	0,4186	0,6869
PolyPara	Age	0,0954	31	-0,268	0,435	0,6097

Table 14. Correlation on HIV/AIDS contraction and HIV/AIDS definition in children with the intensity of hookworm infections and the mean rate of poly parasite infection in schools.

The upper and lower Panels indicate the correlation values between HIV/AIDS contraction (How can someone contract HIV/AIDS?) and definition of HIV/AIDS (What does HIV/AIDS mean?) with intensity of hookworm and *Schistosoma heamatobium* infections, and the mean rate of poly parasitism and age in school children.

The knowledge scores on HIV/AIDS contraction are negatively correlated with hookworm infection intensities, poly parasitism and age. This indicates that with better knowledge on HIV transmission parasite infections are lower and fewer. The definition of AIDS associated positively with age. Thus, IEC sessions which extend beyond parasites have to be intensified to improve children's knowledge different diseases and their transmission. Such aspects on hygiene and prevention may also support to reduce the intensity of hookworm infection and lower the rate of poly parasite infections in schools. These aspects are strongly associated with increasing age.

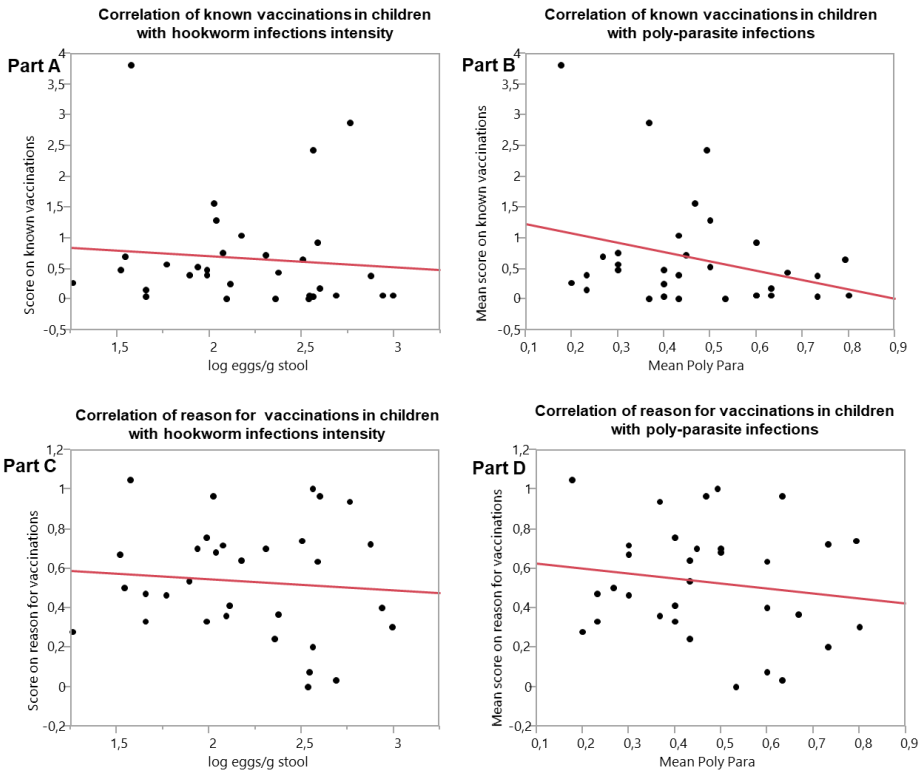


Figure 61. Correlation on known vaccinations and the reasons for vaccination with the intensity of hookworm infections and with poly parasite infections rate in schools In Part A and B the correlation between the knowledge scores on known vaccines (Name vaccines that you know.) and the intensity of hookworm infection in all children groupsand the mean poly parasite infections in schools is shown.
Part C and D the knowledge scores on the necessity for vaccination (Why is it necessary to be vaccinated, answers with their own words.) are correlated with the intensity of hookworm infections and the mean poly parasite infections rates in schools.
In this figure, certain aspects of vaccination, including the recognition of different vaccines and also the importance to be vaccinated is associated with the rate of poly parasitism infections in schools in Part B. Furthermore, the reasons for vaccination are also associated with the mean rate of poly parasite infections in schools in Part D.

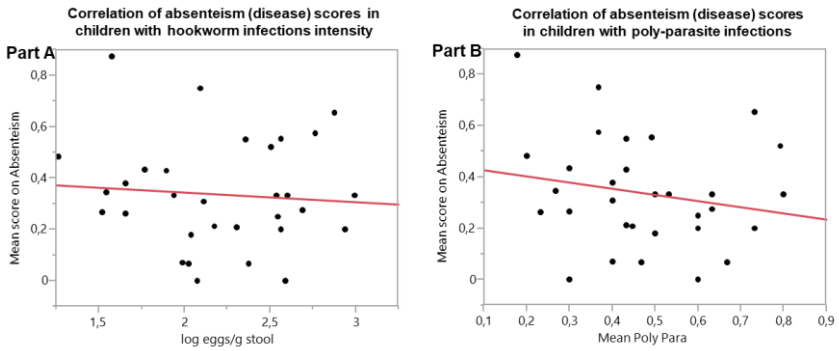


Figure 62. Absenteeism in school because of disease and intensity of hookworm infections and the mean rate of poly parasitism in schools.
Parts A and B show the absenteeism (Have you been absent from classes this year because of a disease?) correlated with the intensity of hookworm infections in all children groups and the poly parasite infection rate in all schools.
Increased absenteeism at classes was found to be associated with lower poly parasite infection rates for part B.
We can note, surprisingly, the more children are absent from classes, the less the intensity of hookworm infections in children (part A) and in part B we can also note that the more schoolchildren are absent from their classes, the less the rate of poly parasite infections in schools. Indeed, here the question could be asked, are schools the places where parasite infest children?

VI. APPLIED AND COMPREHENSIVE SCHOOL-BASED HELMINTH INFECTION CONTROL AS AN OPERATIONAL APPROACH

6.1 Rational and present situation

The yet unsolved problems with parasite-caused diseases in sub-Saharan Africa (SSA) demand resolute and continuous control initiatives. Even though some of the parasite infections in SSA are candidates for successful eradication and elimination (e.g. onchocerciasis, dracunculiasis) and for other common diseases (schistosomiasis, filariasis, trypanosomiasis) effective drugs are available, large populations remain chronically and often co-infected with intestinal helminth and protozoan parasites, notably hookworm and amoeba.
The Institute for Tropical Medicine at University of Tuebingen has established in Togo at the National Institute of Hygiene a Research and Reference Laboratory (ORL). Helminths parasite infection control and the elimination of other neglected tropical diseases has been the focus of activities. Parasitological survey conducted by the ORL have shown that large parts of the rural population in Togo are concurrently infected with intestinal and intravascular protozoan and helminth parasites, notably school children. The application of repeated treatments with albendazole and praziquantel against *Schistosoma spp.* and intestinal helminthes for several years has reduced infection intensities but longitudinal investigations in adults and children have found that parasite co-infections exist in a large part of the pupils, and a single or few interventions will not suffice to eliminate co-infections.

6.2 Parasite co-infections

In large parts of sub-Saharan Africa (SSA), intestinal and intravascular helminth and protozoa parasite infections often occur concurrently (Pennycook et al. 2000). Epidemiological works conducted by the ORL have shown that onchocerciasis, lymphatic filariasis (LF), *Schistosoma spp.,* hookworm and intestinal protozoa co-infections remain widely present in the rural population in Togo. Up to 90% of school children may be found to be infected with helminth or protozoa, with every second child co-infected with more than one parasite species, and a significant pair wise interaction between hookworm and *Schistosoma spp.* was detected providing an increased risk for helminth co-infections (Hamm et al. 2009). In those children co-infected with hookworm, *Schistosoma spp.* and *E. histolytica/dispar* a prominent inflammatory immune response was observed. Annually repeated treatments with albendazole and praziquantel reduced worm infection intensities considerably, and with a reduced parasite load inflammatory immune chemokine responses decreased, but a single intervention was insufficient to fully eliminate co-infections (Hamm et al. 2009). Similarly, adults were co-infected with *N. americanus, E. histolytica and Mansonella perstans* (Hegewald et al. 2015). One reason for the incomplete parasite elimination in poly-parasitized patients may be a continuous and uncontrolled low level transmission of helminth infective-stage larvae despite repeated drug administration.

6.3 Challenges for helminth infection control

The prospects for control, elimination or even eradication of some of the helminth infections are good, as they often have only a limited or focal geographic distribution and seasonal transmission, effective drugs are available and successful containment has been demonstrated in several countries. For control and disease surveillance, the possibility to detect new exposure and also to differentiate chronic from expiring infections is especially important in areas which have previously been known as endemic, then declared as infection-free, but today may be re-infested again, as e.g. in dracunculiasis, schistosomiasis, trypanosomiasis and onchocerciasis.

6.4 Comprehensive approaches for parasite co-infection control

Combined active case finding and treatment with long term follow up of endemic populations, and surveillance of the local intensity of parasite transmission should be persuaded. Interdisciplinary co-operation of medical with social sciences, public and private partnership and personal commitments should develop and qualify human resources, and such strategies should be implemented by regional and community- and school-based platforms, reference points and laboratories for a better application of control measures.

6.5 Conclusion

Community- and school-based single drug administration against helminth infections, as currently applied with ivermectin alone may not eliminate intestinal and intravascular helminth infections, and not suffice to control parasite transmission. Facing low compliance and treatment coverage below 60% in some endemic patient groups, new innovative treatment approaches have to be considered for the future. Combined and situation-adapted treatments against intestinal helminths, schistosomes and other pathogens should find application in parasite control activities – and this will certainly require commitments with duration of 15-20 years. The detection of recrudescence of infection, of uncontrolled parasite transmission and the emergence of drug resistance remains of high priority; here, the strengthening of adapted field research and solid professional capacity building of human resources in tropical medicine and parasitology is required.

VII. DISCUSSION

7.1 Parasite infections worldwide

Parasitic Diseases cause high morbidity and mortality worldwide (Alum A. et al. 2010). Best strategy is prevention and treatment; however, it's not always clear, if both prevention and treatment are well taught, especially to school children. They are the cause of several affections whose consequences are huge. They cause on the health level disorders in infected persons; the therapeutic and preventive measures are often expensive, and they often cause high mortality and morbidity rate in populations.

In the fight against parasitic infections, control programs adopted several approaches. School-age children have often been identified as a target population at whom several interventional approaches were applied. The most common intervention was mass drug administration (MDA) against schistosomiasis and intestinal helminth infections every six months, paralleled by stool examinations by the Kato-Katz technique to monitor success or failure. A significant reduction of the *S. mansoni* and hookworm infection levels was achieved by a single round of MDA in school children (Hodges et al. 2012).

The present study aimed to determine the parasite infectious burden ***(Objective 1)*** and to reduce the parasite infection levels ***(Objective 2)***, particularly of intestinal helminthes infections and schistosomiasis in selected primary schools (EPP) in the central region of Togo. Systematic parasitological surveys were conducted to obtain information on parasite prevalence and infection levels in school children in selected primary schools. Anti-helminthes treatments against intestinal helminthes infections and schistosomiasis were applied.

Information and Education Communication (IEC) courses and teaching materials were provided to the primary schools to improve school children's knowledge on health, parasites and their transmission, and on the common rules of hygiene in the selected schools ***(Objective 3)***. IEC is suggested to be important for a sustained control of parasite infections, because with better knowledge on health and hygiene the lesser the exposure to infection, the lower the re-infection rates and the intensity of infections will be, and also the degree of poly parasite infection will be diminished.

With the results of our study, we were able to show that the association of IEC with repeated systematic de-worming and long term parasitological follow-up (stool and urine sample examinations) could substantially lessen parasite infection levels, reduce poly-parasite infections and improve knowledge on health and hygiene in schools. However, we must be careful to consider these activities as the only mean likely to cause in school-aged children these beneficial effects. It is also necessary to avoid generalization of our results on parasitic infections in school children to all primary public schools (EPP) in the central region of Togo.

Our attempt to substantiate the association between school children's knowledge in health and hygiene with the intensity of helminthes infections and poly parasitism has been resolved with statistical precision, and such we have achieved one of our

objectives. The applied data correlation analyses showed strong dependencies and this allowed us to assess the association of knowledge on health and hygiene with intestinal hookworm and urinary schistosomiasis in the selected schools. The high infection rates in the control group EPP-Plan1, when compared to the EPP-IEC group, is due to missing of educational program and courses on health and hygiene as it was done for the EPP-IEC school children for years. Anti-parasite treatments (MDA) were applied in the selected schools according to the recommendations of WHO and the Togolese Ministry of Health during the present study, and such applied MDA against intestinal helminthiasis and schistosomiasis was altogether successful.

As such, the ***first objective*** of this investigation was accomplished.

This work created a longitudinal database about parasite infections, their prevalence and infection burden in primary schools in all districts in the central region of Togo, notably on hookworm and schistosomiasis. These data allowed us also to better select the suitable periods for anti-parasite treatments, to determine the frequency and the duration of treatments for each EPP according to the intensity of the infections that prevails in order to break the life cycles of the different parasites. Such systematic parasitological surveys and results are the source and reference for national disease control programs in Togo which address parasite and other pathogen infections. Notably, the integrated program for the elimination of neglected tropical diseases (PNEMTN, PLAN) has adapted the diagnostic procedures as applied in this investigation (Kato-Katz) and the prevalence data and geographic locations of the EPP were used by the national program to focus their activities.

As such, ***the second objective*** of this investigation was accomplished.

Education communication and information courses (ICE) in the present study consisted in the training of teachers, pupils and the distribution of teaching materials (Posters and educational manuals) on health and school hygiene in EPP-IEC schools. Here, the aspects taught during IEC sessions extended beyond parasite infection, and covered also general knowledge on diseases, as well as their causes, symptoms and means of prevention, vaccines, HIV/AIDS, and food and personal hygiene.
It should be noted that the teaching of all these lessons in EPPs have been facilitated by the availability of educational materials: the posters always exposed in classrooms describing with pictures and comprehensible text to children, all the diseases concerned by the IEC (diseases symptoms, diseases mode of contraction, how to avoid and how to treat them) and educational manuals for teachers in IEC courses.
As such, ***the third objective*** of this investigation was accomplished.

With certain themes and subjects, such as disease cure, prevention and the use of mosquito netting, it was observed that despite repeated IEC application, the knowledge scores did not improve. The comparison between the two groups still showed that EPP-IEC performed better than the EPP-Plan1 group, except for the scores on the use of preventive mosquito netting.

The EPP-Plan group children would lack knowledge about intestinal parasites, on disease preventive measures and the common hygiene practices of these children were also found to be neglected compared to the EPP-IEC group. Overall, the results from the questionnaire disclose significant differences between the knowledge of

children with IEC sessions and those without IEC. This is conclusively evidenced by the negative correlations between health and hygiene issues and the intensity of hookworm infections and also with poly parasitism in schools. The better the school children knowledge on parasitic infections the less will be the intensities of these infections in school children. Educational programs thus have crucial importance to improve school children knowledge on health, disease transmission and school hygiene, and such early instruction on health and school hygiene leads to reduced intestinal parasite infections in school aged children.

7.2 Level of parasite infections in school children

Fresh stool examinations (Kato-Katz) permitted the qualitative and quantitative determinations of helminthes infection intensities of *Ascaris lumbrocioides*, *Ankylostoma duodenale*, *Trichuris trichiura* and *Schistosoma mansoni*. The urine samples analyses allowed to quantify the intensity of *Schistosoma heamatobium* infection (number of eggs per 10 ml of urine). In schools that have never received mass drug treatments (MDA) hookworm and schistosomiasis infection prevalence was 81.5% and 4.6%, respectively, and after a single mass drug administration (EPP-Plan1 group) the prevalence of hookworm infections was 52.7% and 5.8% for schistosomiasis. In schools that benefited from several MDA interventions and IEC (EPP-IEC groups) the prevalence of hookworm infections dropped to 25.40% (n=626) and to 10.85% (n=627) for schistosomiasis. The Districts of East-Mono (EPP-Plan 1 group) had the highest hookworm infection prevalence (75%), and schistosomiasis was present in all districts although with low prevalence.

7.2.1 Hookworm infection after treatment.

One month after mass drug administration the prevalence of hookworm infections did not attain zero, it was at 39% (median) and often higher. This indicated that a single treatment with albendazole according to the recommended dosage could not completely eliminate intestinal helminthes. Also in most cases, between 5 and 6 months after mass drug administration with albendazole, the prevalence of hookworm infections rose progressively and reached its initial levels only several months later.

7.2.2 The situation on schistosomiasis.

Urinary schistosomiasis affected the majority of schools in the study area (61% in total), most schools were located in the Eastern Mono Districts (75%) with 50% of them in the District of Blitta. Although in the majority of schools from the study area *Schistosoma haematobium* infections were detected, the prevalence per school remained low (between 1 and 10%). Our study groups have been chosen with certain criteria mainly based on the geographical location of the public primary schools (EPPs), and such we recognize that with these criteria some neighboring schools have not been considered.

For the parasitological surveys we used the Kato-Katz methodology and this technique will allow quantitative analyzes and determine the intensity of infections with intestinal helminths especially with *Ascaris lumbricoides*, hookworms, *Trichuris trichiura* and *Schistosoma mansoni*. For this study we have only considered hookworm and schistosomiasis because they were the most encountered infections,

and for the urine samples analysis, the methodology used quantified the intensity of *Schistosoma heamatobium* infections by determining the number of eggs per 10 ml of urine.

7.3 Information, Education and Communication Courses (IEC) and Teaching Materials

The knowledge scores in children's was found to be much better in the study group (EPP-IEC) with IEC application, than in the EPP-Plan1 sample (control group), and this has been observed for all aspects of health and hygiene, i.e. school hygiene, disease causes and symptoms, means of prevention and cure and vaccination. School children in EPP-IEC1 had better knowledge ($p<0.0033$) on health and hygiene after one year of IEC than those from EPP-Plan, and after 2 years of IEC this difference between EPP-IEC and EPP-Plan was found to be highly significant ($p<0.0008$). This difference can be noted in all the themes of the questionnaire (known diseases, diseases causes, diseases symptoms, diseases cure and the means of prevention etc.). The results also indicated that school children's knowledge scores on vaccines, HIV/AIDS and food hygiene were better in the EPP-IEC group than in the sample (EPP-Plan1). Our results with the questionnaire and health education correspond with previous works (Gyorcos et al. 2013) where the impact school-based health hygiene education intervention was investigated in school children from Peru; their results indicated that intervention was effective in increasing soil transmitted helminthes knowledge and in reducing *Ascaris lumbricoides* infection, and school children with IEC performed significantly better on all aspects of knowledge when compared with control children. It was concluded that school-based periodic deworming programs are likely to be enhanced when a sustained health hygiene education intervention is integrated into school curricula (Gyorcos et al. 2013).

The present study has also shown that annually repeated de-worming campaigns (combined with urine and stool samples examinations) can assist to reduce the intensity and the prevalence of parasitic infections with hookworm and schistosomiasis in children. Such effectiveness has also been shown in a study on the control of schistosomiasis in Ivory Coast (Côte d'Ivoire) (Assaré et al. 2016); their results disclosed that one year after the initial mass drug administration (MDA), *Schistosoma mansoni* prevalence had decreased but infection intensity in children was slightly higher at the 1 year follow-up when compared to the baseline situation. Our results from the parasitological surveys have shown that between 5 and 6 months after MDA with albendazole, the hookworm infection levels increased progressively and reaches their initial levels at 1 year post initial MDA. In contrast, in school children in Peru (Gyorcos et al. 2013) the intensity of *Ascaris lumbricoides* infection was significantly lower at follow-up in children from the treatment group (58%) when compared with control schools (81%) without any intervention.

In another investigation on hookworm infection intensities and soil-transmitted helminthes re-infection, no significant effects on the overall prevalence and intensity of *Trichuris trichiura*, hookworm, or *Schistosoma mansoni* re-infection were observed when only school-based hygiene measures, water quality and sanitation were improved (Freeman et al. 2013). It was concluded that provision of sanitation, water and hygiene improvements may reduce re-infection of soil transmitted helminthes

after school-based de-worming, but the magnitude of the effects may be sex- and helminthes species-specific (Freeman et al. 2013).

While our results correspond with the questionnaire results from a study in Peru (Gyorcos et al. 2013), our surveys concentrated on hookworm and schistosomiasis and here we observed a prominent reduction of helminthes infections levels in the EPP-IEC groups after several years of health and school educational teaching courses (IEC). Nevertheless, parasitological monitoring combined with de-worming MDA, hygiene and school health education are necessary for a better and sustained control of helminthes infections in school children. It should also be noted that a one-year study period would not be sufficient to expect a decrease in the level of hookworm infections in school children, and this may account for the lack of effect on hookworm infection and the discrepancies between the above studies (Gyorcos et al. 2013, Freeman et al. 2013).

A significant reduction in *Schistosoma mansoni* and hookworm infection was achieved by the first MDA round in school-going children in Sierra Leone (Hodges et al. 2012) and a cross-sectional sentinel site survey conducted 6 months post-MDA showed that this may in addition help to reduce morbidity, such as anaemia; but single de-worming could not ensure a persistent reduction in hookworm and *Schistosoma mansoni* infections in school children and did not prevent re-infestations few months post MDA. Furthermore, preventive mass drug administration targeting school children has limits (Acka et al. 2010), as older parts of the population are not involved and the lack of knowledge about how to avoid and control intestinal helminthes infections will facilitate exposure and re-infection. From that study it is concluded that improved access to clean water and sanitation is necessary, but should be applied along with health education to make a durable impact against helminthes infections (Acka et al. 2010).

Several investigations have addressed the problem of parasite infection control in school children with diversified methodologies, several showed the importance of information education and communication courses (IEC) for the initiation of behavioral changes which then may support the reduction of helminthes infections, and also limit re-infections. Questionnaires were used to identify socio-demographic and associated risk factors and significant associations were observed between intestinal helminth infection and age, school grade level, and private or public school variables, and prevalence of hookworm infection was significant in children who did not wear shoes regularly (Abera A. & Nibret E. 2014). The investigators suggested that education on personal and environmental hygiene should be implemented for the prevention and control of helminthic infections in the study area.

The importance of IEC is also suggested to be important for the sustained control of other parasite infections, e.g. onchocerciasis, where a good level of knowledge, attitude and perception is needed for the massive adherence of populations to onchocerciasis control programs. Good attitude and perception motivated the continuation of future control activities and plans should focus on educational strategies to maintain a considerable treatment adherence to achieve an effective reduction of the parasite prevalence (Makenga Bof et al. 2017). This suggests that in

order to better control onchocerciasis in the future it will be necessary to use IEC technics to reach large parts of the target population (Makenga Bof et al. 2017).

Similarly after a decade of anti-helminthes intervention, a marked decrease in prevalence of urban schistosomiasis and soil transmitted helminthiases occurred in young school children in Dar es Salaam and Tanga, Tanzania (Mwakitalu et al. 2014). Such promising developments appeared to have been accomplished by MDA programs, in combination with environmental changes (i.e. fewer snail habitats) and generally improved levels of hygiene. Future efforts should include not only treatment but also health education being considered as important to maintain the positive achievements (Mwakitalu et al. 2014). Our activities and results are supportive to those suggestions for a better and sustainable control of urban schistosomiasis and soil transmitted helminthes in school children - this study used the same approach as we have applied in our works to induce behavior changes and improve hygienic rules. In addition, in Dar es Salamm and Tanga (Mwakitalu et al. 2014), the parents were included, and through education, the children's knowledge was extended to recognize the causative agents, the mode of transmission (i.e. by snails and water contact), the preventive measures and the pathological consequences and effects of schistosomiasis (Mwakitalu et al. 2014).

Furthermore, education on hygiene can help to prevent parasitic diseases in earlier age as shown in an investigation on intestinal parasites and level of hygiene knowledge in students (Altinöz et al. 2015). Our findings and associations between children's knowledge (i.e. the test scores on health and hygiene) and the intensity of intestinal helminthes infections are findings which agree with those from previous studies (Midzi et al. 2011). Primary school children from Zimbabwe were interviewed using a pre-tested interviewer and a questionnaire was applied asking about the use of soap to wash hands after toilet and before eating food, and whether they wore shoes. Thus, by targeting health messages to school children the most vulnerable population was reached, and empowered them with basic knowledge which could protect against schistosomiasis, intestinal helminthes and malaria (Midzi et al. 2011).

In addition, our results also showed that the better the knowledge scores on health and hygiene were the lesser not only the intensity of hookworm infections but also the lesser poly parasitism was present in schools (Figure 41).
Co-infections in the developing world were attributed as "partners in crime" being the rule rather than the exception, and treatment strategies must take this into account to make progress in tackling infectious disease in man (Pennycook et al. 2000):
In large parts of sub-Saharan Africa, intestinal and intravascular helminth and protozoan infections often occur concurrently (Petney & Andrews 1998). Up to 90% of schoolchildren may be found to be infected with helminths or protozoa (Utzinger et al. 1998), with every second child being co-infected with more than 1 parasite species (Raso et al. 2004, Bethony et al. 2006). Although the prevalence and intensity of most parasite infections is extremely low, particularly during infancy, it reaches a peak at school age and may decline later in life. Gradually, the number of parasites and the parasite density will increase, multiple-parasite infections will generate a range of overlapping clinical symptoms (Pennycook et al. 2000), and chronic parasite persistence will impede the physical and cognitive development of children (McGarvey et al. 1993, Ezeamama et al. 2005).

Our previous works on poly-parasite infections as well as the effect of anti-parasite treatment in children showed that 32% were singly infected, and 54% were infected with 2 or more parasite species. The most common double infection was with hookworm and amoeba; triple infections were with hookworm, amoeba and urinary schistosoma (Hamm et al. 2009), and analysis disclosed a significant risk for co-infection with hookworm and *Schistosoma* species. Poly-parasite infections detected in 23% of children before treatment were present in 5% at 15 months after treatment. (Hamm et al. 2009). Similarly, a study completed in semi-urban primary schools in Togo (Hegewald et al. 2015), children were infected with *Entamoeba histolytica/ dispar* (62%), *Necatora mericanus* (hookworm) (31%), *Schistosoma haematobium* (28%), *S. mansoni* (21%), *Hymenolepis nana* (tapeworm) (2%) and *Strongyloides stercoralis* (1%) and singly infected were 37%, 47% were positive for 2 or more parasite species and only 16% were infection-free. Here, it was concluded that with an increasing number of parasite infections pro-inflammatory immune responses enhanced, and in poly-parasitized children skin test reactivity to allergens was highest suggesting that parasite co-infections may trigger or amplified atopic responsiveness (Hegewald et al. 2015).

7.4 Infection and disease prevention

7.4.1 Malaria Prevention

In the present works educational materials (booklets, posters) were developed and courses applied in schools to present, to sensitize and to improve the knowledge about parasites and other important pathogen infections (TB, HIV), and on the prevention of infection and disease. The selected themes and topics corresponded to those diseases which affect most the population in central Togo. The annual report from the Regional Health Authorities (Direction Régional de la Santé (DRS-RC)) indicates the main causes of morbidity in the population (Table 1).
The major causes for morbidity in patients from central Togo is malaria (60.4%) followed by upper respiratory tract infections (IRA 7.2%), injuries (5.9%) and intestinal parasite infections (5.8%). Malaria is a significant public health challenge in sub-Saharan Africa, and it is the leading cause of morbidity and mortality especially in children under five years of age. The current global malaria control interventions are the use of long lasting insecticide impregnated bed nets (LLINs), indoor residual spraying (IRS), and preventive chemotherapy including intermittent preventive treatment among pregnant women, and prompt diagnosis and treatment. Today, the best known preventive measure in rural Ugandan populations against malaria is sleeping under bed nets, either impregnated or not (known by >80%), followed by the use of mosquito coils, taking preventive medicine, using skin repellents and last the destruction of the mosquito breeding sites (Musoke et al. 2015). The use of mosquito nettings is strongly advocated by WHO and has during the last decade shown considerable success in reducing malaria morbidity worldwide (World malaria report 2011). The knowledge on malaria parasite transmission, early signs of disease, on preventive measures and prevention and treatment are of uppermost importance and should be applied from early ages on.

Our IEC material and courses addressed those malaria-related issues specifically, and our findings on the use of mosquito netting confirm that better knowledge on malaria prevention in school communities will add to diminish the number and intensities of parasite infections.
The bed net use among school-aged children (SAC) was evaluated after a mass bed net distribution campaign in Malawi in combination with routine distribution through health clinics, and the study concluded, that such single activity is not sufficient to cause a sustained increase in net usage among SAC (Buchwald et al. 2016). Our findings have similarly observed that bed net usage scores (i.e. results from our questionnaire) declined in the third year of IEC, these results show that a single campaign of mosquito netting distribution, and a short IEC session are not sufficient to induce a sustained increase in mosquito netting use among school aged children.

7.4.2 Helminthes infection prevention

Previously observed, de-worming treatment has had an effect on the parasite load in children but no improvement in school performance occurred; during the helminthes parasite infection-free period no improvement in reading, vocabulary, or attendance was observed (Watkins et al. 1996). Our results on the effects of de-worming on indicators of school performance diverge from the above works, such differing findings could be due to the unequal samples size and the length of study, and it should be noted that our study was not addressing school performance but focused on the acquisition of knowledge in the field of health and hygiene.
The database systemic review by Taylor-Robinson (2007) suggested first that de-worming drugs used in targeted community programs may be effective in relation to weight gain in some circumstances, and had no effect on cognition or school performance. Our results diverge with those findings as we observed that the knowledge scores in EPP-IEC children were better than in the EPP-Plan1 group after the first and the second year of de-worming and IEC. There is limited support that routine treatment of children in areas where helminthes are common has effects on weight gain, and there is insufficient evidence whether this intervention improves cognitive performance. In an updated database systemic review re-analyzing the available results, de-worming interventions, based on the expectation that there will be an improvement in growth and learning do not provide consistent or reliable evidence (Taylor-Robinson et al. 2007).

7.4.3 Infection Prevention by Vaccination

The World Health Organization (WHO) in its Bulletin in 2008 has shown that a comprehensive vaccination program is a cornerstone of good public health and will reduce inequities and poverty, and that efficacious vaccines will protect individuals if administered before exposure. Pre-exposure vaccination of infants with several antigens is the cornerstone of successful immunization programs against a cluster of childhood diseases (WHO, 2008).
For the present study, to assess vaccination coverage and the awareness of its importance in children of selected schools, a teaching module has been introduced

in the IEC sessions and focuses on different aspects of vaccination. The results from our questionnaire revealed that with the repeated IEC sessions in the EPP-IEC group, children knowledge in this group proved to be better when compared to the EPP-Plan1 group. Scores comparison between EPP-IEC3 and all other groups showed significant differences ($p<0.0001$), especially with the knowledge of EPP-Plan1 children. It should also be noted that our findings in relation to the association of children's knowledge on many aspects of vaccinations, (reason for vaccination, Vaccination Yes/No, vaccination against TB and Polio) with intestinal helminth infections revealed strong dependencies.

Regarding vaccine-preventable diseases in Togo, the Ministry of Health is often supported by WHO and other NGOs in major vaccination campaigns that prevail in Togo. These campaigns often take into account children aged 0-5 years and pregnant women.

Vaccination against poliomyelitis is applied to control this disease in Togo, children aged 0 to 5 are often vaccinated. In Togo, all the children in risk to be affected by this disease are vaccinated every year, which places Togo among the first countries to have stopped the transmission of wild polio virus. It should be noted that the last case of wild polio virus reported in Togo has been reported in the end of March 2009 (activity report Ministry of Health 2010). Integrated vaccination campaigns against measles, vitamin A supplementation and de-worming with albendazole for children aged 6 months to 5 years are often implemented throughout Togo.

At the national level, there are also routine vaccinations in each district. These vaccinations take into account antigens of the expanded vaccination program (PEV: Programme élargie de vaccination) in Togo, which considers the vaccines BCG, VPO, DTCoq-HepB-Hib, VAR and VAA. In the central region, the vaccination coverage rate for BCG is estimated at 77%, polio 79.5%, DTCoq 81.6%, varicella 76.6%, while it varies between 39.1% and 5.9% for the various tetanus vaccines (Annual report MS/DRS RC 2015). For all these vaccinations, the report of the Ministry of Health has shown that vaccination coverage improves year by year. It should also be noted that Togo is part of the meningitis belt reaching from the Atlantic to the Red Sea and comprising 26 countries. The population at risk in this area is estimated to be 430 million, and in this area, epidemics of meningitis often occur in dry seasons. Each year, among vaccine-preventable diseases, measles still causes death of more than half of the infected children. Among those children who survived measles, up to 10% will suffer from disabilities such as blindness, deafness and irreversible brain damage (Report on Measles Immunization Measure Ministry of Health/Togo 2015).

In the event of an epidemic, Togo is often assisted by international organizations such as World Health Organization (WHO), United Nations Children's Fund (UNICEF) and PLAN International-Togo in terms of response and coordination. In the year 2017, 324 cases of meningitis have been recorded in the Kara and Central regions of Togo and among those cases 24 deaths were reported (rate of 7.41%). At the national level, for meningitis and other epidemics, awareness-raising and education campaigns often occur only with the onset of diseases, which contrasts with our approach to promoting a maintained long-term education in the population at risk.

The present study showed that, with IEC on vaccination issues, school children in EPP-IEC group were able to acquire better knowledge for importance of vaccination as compared those in EPP-Plan 1 and strong correlations have been seen between

school children's knowledge on vaccination aspects with parasitic infections ($P<0.0007$ for the intensity of infections with hookworm infection and $p<0.0001$ for poly parasitism) showing that good knowledge and earlier education on vaccination could help to lessen or avoid infections within populations and specifically in school children.

7.4.4 Disease Prevention by Hygiene Measures

Diseases linked to the lack of sanitation and hygiene constitute a huge burden in developing countries, and it is estimated that about 88% of diarrheal disease are caused by inadequate sanitation and hygiene (WHO, 2004c).

Previously observed, provision of school-based sanitation, water quality, and hygiene improvements may reduce re-infection of STHs after school-based deworming (Freeman et al, 2013). A study to determine the prevalence of gastrointestinal helminthes and associated risk factors among school children has also observed that the prevalence of hookworm infection was significant in children who did not wear shoes regularly (Abera A. & Nibret E, 2014). Our results on the knowledge score on hygiene showed an increasing level of knowledge on hygiene aspects with the IEC session in EPP-IEC groups and the highest score were found in the EPP-IEC3 group when compare with other groups ($P<0.0001$). The lowest scores on these aspects were found in EPP-IEC1 (first year of IEC interventions) and EPP-Plan1 groups (control group without IEC session). Regarding the associations on knowledge scores on hygiene with hookworm infection intensity in school children, our results reveled negative correlations with strong dependencies ($p<0.0007$) for hookworm infection intensity ($p<0.0001$) and for poly parasite infections in schools. This is strongly supporting that the more children obtain notions on hygiene practice, the less they are infected. Previously observed, improving access to clean water and sanitation is necessary, along with health education, to make a durable impact against helminth infections (Acka et al, 2010). Our study agree with this finding which has shown that enhancement of sanitation, personal hygiene, increased awareness of people and health education can be effective in reducing parasitic infections in different communities (Daryani et al, 2017). These finding showed that, improving parasites detection methods, sanitation facilities, and personal hygiene as well as using combined drugs are all important measures to greatly reduce intestinal parasite infections school children (Liao et al, 2017).

While our actions on behavior change by IEC have induced improvements in EPP-IEC schools, it should be noted that in most of the schools in the central region of Togo, hygiene measures remain problematic. Most of schools are often completely lacking safe drinking-water, sanitation such us handwashing facilities and well-maintained playgrounds for school children. Hygiene and sanitation in schools will influence school children’s health. Wilderness defecation, often around the schools play grounds, is watered with urine and rainwaters, and flooding the toilets. The unavailability of sanitary facilities and the low level of appropriate hygiene attitudes and practices, i.e. children often walk barefoot, play in stagnant and contaminated waters, often eat with dirty hands and food is sold to the school children under poor hygienic conditions in schools. Furthermore, in those schools where some of such

facilities exist they are often poorly maintained and are insufficient. All these factors favor the transmission of parasite infections; poor sanitation and lacking hygiene settings and also the intense level of person-to-person contact in over-crowded schools constitute high risk factors and contagious environments for school children and their teachers. This can compromise school attendance for children's and their learning ability.

7.5 Study Difficulties and Limitations

Some difficulties were encountered during this study.

For some school children in rural villages stool and urine sampling for parasitological analyzes was the first time, and often difficult to obtain the necessary sample volumes and to motivate for participation. During mass drug administration for systematic de-worming some children in the rural zones were reluctant to take medication as they were not used to take such products. Most of the schools within this study were investigated and treated repeatedly as recommended, but the availability of medication (praziquantel, albendazole) was not always guaranteed and the products' costs and expenses limited to expand this work. Accessibility to certain schools in the rural area was difficult when paths were impracticable during rainy season. Adapted equipment is essential for such activities notably appropriate vehicles for field works. We have used Kato Katz and centrifugation as methodologies for sample analysis, and we could not proceed with advanced methodologies like real-time PCR which is more sensitive and could have revealed further details on the parasite infection prevalence.

With the present research, we have been able to identify certain dependencies between children's knowledge on health and hygiene issues with parasitic infections. However, care must be taken to say that these factors (IEC and deworming) are the only ones likely to cause the reduction in parasitic infections and the change of hygienic behavior in schoolchildren. Our study only addressed public primary schools (EPPs). We have not been able to reach private and religious primary schools in the same areas to compare their knowledge on health and hygiene issues and to also determine the prevalence of parasitic infections in these schools.

This investigation was accomplished in some EPP in the central region of Togo, this region is vast and our present results cannot be representative for all EPPs in that region, and thus we must beware of a generalization to all primary schools, especially the public EPP in Togo.

7.6 RECOMMENDATIONS

Based on our experiences and difficulties encountered during this activity it will be necessary to repeatedly conduct parasitological surveys before each de-worming campaign to better assess the prevalence as well as the intensities of parasite infections in the study area. In order to strengthen schoolchildren and teachers knowledge on parasite infections and hygiene, IEC should be introduced into the curricula. The timing of anti-parasite treatments should be better defined, and advisable is to treat school children at the end of the rainy seasons. The treatment

session should be extended for several days, in order to cover the absent children and to reduce the parasite load (treatment over 3 days, for example). To prevent re-infestation, treatments should be repeated every 4 months. In schools where parasite infections intensities are lower and less than 10%, treatment should be done case by case depending on the prevalence selectively targeting positive cases. Secondary schools (college) should become part of helminthes infection control activities, and the situation of parasite infections at this educational level should be assessed, notably as children may leave primary schools with parasite infections which are not negligible.

VIII. CONCLUSIONS

The present works allowed assessing the prevalence of intestinal parasites in public primary schools in central Togo (Objective 1), with health education courses (IEC) the knowledge on pathogen and parasite diseases improved and de-worming mass drug administration reduced parasite infection levels *(Objective 2)*, and IEC changed attitudes and practices of hygiene in children in public schools in the central region of Togo aiming at the overall improvement of their health status *(Objective 3)*.

The knowledge on intestinal parasitic infections and attitudes and practices of hygiene in children were low, while the prevalence of intestinal parasites was high. For the purpose of this study educational materials were elaborated, first a document manual for teachers who were formed on the various aspects of the most important parasite infection in central Togo. Second, for the Information education and communication (IEC) to children posters were created and distributed to the schools; these materials covered the major parasite infections (malaria Hookworm, schistosomiasis, ascariasis, onchocerciasis, TB and HIV/AIDS) as well as Hygiene and prevention of diseases (school hygiene, vaccination). The IEC courses were taught by the EPP teachers and the impact of IEC on knowledge and performance in school children was evaluated thereafter by questionnaire. In parallel, annually replicated deworming treatments MDA (Mass Drug administration) were applied by the project in cooperation with health services from polyclinics and the regional health directory.

Parasite loads decreased significantly in the study group (EPP-IEC) with MDA, intestinal parasitic infection surveys and IEC programs. Despite all these measures and after years of intervention in schools, the prevalence has considerably declined but still at not to negligible level. The prevalence of hookworm infection and urinary schistosomiasis (in the EPP-IEC group) was 59.34% (n=755) and 37.95% (n=627), respectively at the beginning in the study groups, and decreased to 17.34% (year 5), 12.62% (year 6) and 25.40% (year 7) (Table 8) for hookworm and 9.36% (year 5) 19.70% (year 6), 10.85% (year 7) (Table 9) for schistosomiasis. The prevalence remained high in all groups (EPP-IEC and EPP-Plan) 46.7% (n=2324) (Table 4) with hookworm infection, while the prevalence of urinary schistosomiasis was 22.9% (n=8942) (Table 5).

It should also be noted that children were often poly parasitized in the whole study group (EPP-Plan1 and EPP-IEC) 6.1% (n=8393) (Table 6) having both hookworms and schistosomiasis), which are the most common infections in the study area.

With health education programs (IEC), the results of the questionnaire indicate that children knowledge developed significantly better in the EPP-IEC group than in the EPP-Plan group. This observation can be seen in all taught aspects of hygiene and school health.

Associations were established on the knowledge scores in health issues with parasite load in school children. These correlations showed strong dependencies meaning that the better school children's knowledge in health, hygiene, parasite infections and diseases prevention, the lower hookworm infection intensities were in children. For most of these associations the dependencies were highly significant with $p<0.0001$.

CONCLUSIONS

The present study shows that to better control parasitic infections in school children, long term parasitological surveys (stool and urine samples examination) in schools, combined with IEC programs should be initiated. Repetitive de-worming campaigns will reduce the intensities of different parasite infections in school children and IEC programs will strengthen teachers' and school children knowledge on the mode of parasite transmission and on preventive measures against parasite infections. However, the most prevalent hookworm and schistosomiasis helminths infections remained at hypo endemic levels in the study schools despite repeated IEC and treatment campaigns. Here extended control approaches are needed which reach the children entire families and households as well as the communities which should engage and implement their possibilities to control infectious diseases. Integrated approaches and actors are required for a comprehensive helminths disease control which should cover and reach beyond schools.

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IX. PUBLICATIONS

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11. Coinfections with Schistosoma haematobium, Necator americanus, and Entamoeba histolytica/Entamoeba dispar in children: chemokine and cytokine responses and changes after antiparasite treatment. Hamm DM, Agossou A, Gantin RG, Kocherscheidt L, Banla M, Dietz K, Soboslay PT. J Infect Dis. 2009 Jun 1; 199(11):1583-91. doi: 10.1086/598950. PMID: 19392635

X. ANNEX

11.1 All parameters for correlations between health knowledge and the intensity of hookworm infections and poly parasitism school children

Table 15.Correlations of parameters from knowledge scores and parasitology from the questionnaires Parameter correlations between IEC courses and health knowledge on causes, signs, prevention, vaccination and the intensity of hookworm infections and poly parasitism in schools. The correlations are between mean values of parameters for all n children tested.

Variable 1	Variable 2	Corr. R	n	95% low CI	95% up CI	p value
Nbr IEC	log (eggs/10ml urine)	0,0527	1160	-0,0049	0,1099	0,0727
Nbr IEC	log (eggs/g stool)	-0,0747	1643	-0,1227	-0,0265	0,0024
Nbr IEC	PolyPara	0,0391	1930	-0,0055	0,0836	0,086
Nbr IEC	Age	0,2598	1540	0,2126	0,3058	<,0001
TOTAL POINTS-JMP	log (eggs/10ml urine)	0,0358	1160	-0,0218	0,0932	0,223
TOTAL POINTS-JMP	log (eggs/g stool)	-0,1081	1643	-0,1556	-0,06	<,0001
TOTAL POINTS-JMP	PolyPara	-0,0393	1930	-0,0838	0,0053	0,0845
TOTAL POINTS-JMP	Age	0,1893	1540	0,1407	0,2371	<,0001
TOTAL POINTS-JMP	Nbr IEC	0,5778	2010	0,5479	0,6062	<,0001
log (eggs/g stool)	log (eggs/10ml urine)	0,1995	873	0,1349	0,2624	<,0001
PolyPara	log (eggs/10ml urine)	0,6426	1160	0,6076	0,6752	<,0001
PolyPara	log (eggs/g stool)	0,8396	1643	0,8247	0,8533	<,0001
Age	log (eggs/10ml urine)	-0,0071	702	-0,0811	0,0669	0,851
Age	log (eggs/g stool)	-0,0481	1346	-0,1012	0,0054	0,0779
Age	PolyPara	-0,0284	1461	-0,0796	0,0229	0,2783
SubTotal Known Diseases	log (eggs/10ml urine)	0,0147	1160	-0,0429	0,0722	0,616
SubTotal Known Diseases	log (eggs/g stool)	-0,1111	1642	-0,1587	-0,0631	<,0001
SubTotal Known Diseases	PolyPara	-0,0783	1929	-0,1225	-0,0338	0,0006
SubTotal Known Diseases	Age	0,0966	1539	0,0468	0,1458	0,0001
SubTotal Known Diseases	Nbr IEC	0,2837	2009	0,243	0,3234	<,0001
SubTotal Known Diseases	TOTAL POINTS-JMP	0,4223	2009	0,3857	0,4576	<,0001
SubTotal Disease Cause	log (eggs/10ml urine)	0,1009	1160	0,0436	0,1575	0,0006
SubTotal Disease Cause	log (eggs/g stool)	-0,0291	1643	-0,0773	0,0193	0,2386
SubTotal Disease Cause	PolyPara	0,0363	1930	-0,0084	0,0807	0,1113
SubTotal Disease Cause	Age	0,1259	1540	0,0764	0,1748	<,0001
SubTotal Disease Cause	Nbr IEC	0,4777	2010	0,4433	0,5108	<,0001
SubTotal Disease Cause	TOTAL POINTS-JMP	0,6364	2010	0,6096	0,6617	<,0001
SubTotal Disease Signes	log (eggs/10ml urine)	0,0367	1160	-0,0209	0,0941	0,2117
SubTotal Disease Signes	log (eggs/g stool)	-0,0351	1643	-0,0833	0,0133	0,1551

SubTotal Disease Signes	PolyPara	0,0347	1930	-0,0099	0,0792	0,1276
SubTotal Disease Signes	Age	0,1529	1540	0,1037	0,2013	<,0001
SubTotal Disease Signes	Nbr IEC	0,6405	2010	0,614	0,6656	<,0001
SubTotal Disease Signes	TOTAL POINTS-JMP	0,836	2010	0,8223	0,8487	<,0001
SubTotal Disease Cure	log (eggs/10ml urine)	-0,0418	1160	-0,0991	0,0158	0,1545
SubTotal Disease Cure	log (eggs/g stool)	-0,1816	1643	-0,228	-0,1344	<,0001
SubTotal Disease Cure	PolyPara	-0,166	1930	-0,2091	-0,1223	<,0001
SubTotal Disease Cure	Age	0,1234	1540	0,0739	0,1722	<,0001
SubTotal Disease Cure	Nbr IEC	0,0242	2010	-0,0196	0,0678	0,2784
SubTotal Disease Cure	TOTAL POINTS-JMP	0,5297	2010	0,4975	0,5604	<,0001
SubTotal Disease Prevention	log (eggs/10ml urine)	-0,0269	1160	-0,0843	0,0307	0,36
SubTotal Disease Prevention	log (eggs/g stool)	-0,1681	1643	-0,2147	-0,1207	<,0001
SubTotal Disease Prevention	PolyPara	-0,1337	1930	-0,1773	-0,0896	<,0001
SubTotal Disease Prevention	Age	0,1861	1540	0,1374	0,2338	<,0001
SubTotal Disease Prevention	Nbr IEC	0,0532	2010	0,0095	0,0967	0,017
SubTotal Disease Prevention	TOTAL POINTS-JMP	0,5437	2010	0,5122	0,5738	<,0001
SubTotal Know Vaccination	log (eggs/10ml urine)	0,0358	1160	-0,0218	0,0932	0,223
SubTotal Know Vaccination	log (eggs/g stool)	-0,048	1643	-0,0961	0,0004	0,0519
SubTotal Know Vaccination	PolyPara	0,0035	1930	-0,0411	0,0481	0,8784
SubTotal Know Vaccination	Age	0,0985	1540	0,0488	0,1477	0,0001
SubTotal Know Vaccination	Nbr IEC	0,3818	2010	0,3438	0,4185	<,0001
SubTotal Know Vaccination	TOTAL POINTS-JMP	0,7163	2010	0,6943	0,7369	<,0001
SubTotal Know VIH/SIDA	log (eggs/10ml urine)	-0,0135	1160	-0,0711	0,044	0,6448
SubTotal Know VIH/SIDA	log (eggs/g stool)	-0,1493	1643	-0,1962	-0,1016	<,0001
SubTotal Know VIH/SIDA	PolyPara	-0,121	1930	-0,1647	-0,0768	<,0001
SubTotal Know VIH/SIDA	Age	0,1664	1540	0,1174	0,2146	<,0001
SubTotal Know VIH/SIDA	Nbr IEC	0,1866	2010	0,144	0,2284	<,0001
SubTotal Know VIH/SIDA	TOTAL POINTS-JMP	0,6819	2010	0,6578	0,7046	<,0001
SubTotal Hygiene Measures	log (eggs/10ml urine)	0,0297	1160	-0,0279	0,0871	0,3128
SubTotal Hygiene Measures	log (eggs/g stool)	-0,0033	1643	-0,0517	0,0451	0,8935
SubTotal Hygiene Measures	PolyPara	0,0538	1930	0,0092	0,0982	0,0181
SubTotal Hygiene Measures	Age	0,1166	1540	0,067	0,1656	<,0001
SubTotal Hygiene Measures	Nbr IEC	0,5819	2010	0,5522	0,6101	<,0001
SubTotal Hygiene Measures	TOTAL POINTS-JMP	0,562	2010	0,5313	0,5912	<,0001
SubTotal Know MosquitoNet	log (eggs/10ml urine)	-0,0118	1160	-0,0693	0,0458	0,6876
SubTotal Know MosquitoNet	log (eggs/g stool)	-0,0065	1643	-0,0548	0,0419	0,793
SubTotal Know MosquitoNet	PolyPara	-0,0395	1930	-0,084	0,0051	0,0827
SubTotal Know MosquitoNet	Age	-0,089	1540	-0,1383	-0,0392	0,0005
SubTotal Know MosquitoNet	Nbr IEC	-0,3378	2010	-0,376	-0,2985	<,0001
SubTotal Know MosquitoNet	TOTAL POINTS-JMP	-0,1228	2010	-0,1656	-0,0795	<,0001
SubTotal School-Absentisme	log (eggs/10ml urine)	0,0098	1160	-0,0478	0,0673	0,74
SubTotal School-Absentisme	log (eggs/g stool)	0,1262	1643	0,0784	0,1735	<,0001
SubTotal School-Absentisme	PolyPara	0,1109	1930	0,0666	0,1548	<,0001
SubTotal School-Absentisme	Age	-0,0403	1540	-0,0901	0,0096	0,1137
SubTotal School-Absentisme	Nbr IEC	-0,0076	2010	-0,0513	0,0362	0,7344
SubTotal School-Absentisme	TOTAL POINTS-JMP	-0,0752	2010	-0,1185	-0,0316	0,0007

Nbr Known Diseases	log (eggs/10ml urine)	0,0147	1160	-0,0429	0,0722	0,616
Nbr Known Diseases	log (eggs/g stool)	-0,1111	1642	-0,1587	-0,0631	<,0001
Nbr Known Diseases	PolyPara	-0,0783	1929	-0,1225	-0,0338	0,0006
Nbr Known Diseases	Age	0,0966	1539	0,0468	0,1458	0,0001
Nbr Known Diseases	Nbr IEC	0,2837	2009	0,243	0,3234	<,0001
Nbr Known Diseases	TOTAL POINTS-JMP	0,4223	2009	0,3857	0,4576	<,0001
Cause Malaria	log (eggs/10ml urine)	0,0174	1160	-0,0402	0,0749	0,5539
Cause Malaria	log (eggs/g stool)	-0,0662	1643	-0,1142	-0,0179	0,0073
Cause Malaria	PolyPara	-0,048	1930	-0,0924	-0,0033	0,0351
Cause Malaria	Age	0,0668	1540	0,0169	0,1163	0,0088
Cause Malaria	Nbr IEC	0,1989	2010	0,1566	0,2406	<,0001
Cause Malaria	TOTAL POINTS-JMP	0,399	2010	0,3616	0,4352	<,0001
Cause Schistosomiasis	log (eggs/10ml urine)	0,0451	1160	-0,0125	0,1023	0,1251
Cause Schistosomiasis	log (eggs/g stool)	-0,0648	1643	-0,1128	-0,0165	0,0086
Cause Schistosomiasis	PolyPara	-0,0185	1930	-0,0631	0,0261	0,4155
Cause Schistosomiasis	Age	0,0363	1540	-0,0137	0,0861	0,1546
Cause Schistosomiasis	Nbr IEC	0,2233	2010	0,1814	0,2645	<,0001
Cause Schistosomiasis	TOTAL POINTS-JMP	0,4343	2010	0,3981	0,4691	<,0001
Cause Ankylostomiasis	log (eggs/10ml urine)	0,0652	1160	0,0077	0,1223	0,0263
Cause Ankylostomiasis	log (eggs/g stool)	-0,0216	1643	-0,0698	0,0268	0,3825
Cause Ankylostomiasis	PolyPara	0,0088	1930	-0,0358	0,0534	0,6993
Cause Ankylostomiasis	Age	0,0552	1540	0,0053	0,1049	0,0303
Cause Ankylostomiasis	Nbr IEC	0,2515	2010	0,2101	0,292	<,0001
Cause Ankylostomiasis	TOTAL POINTS-JMP	0,2878	2010	0,2472	0,3274	<,0001
Signs-Malaria	log (eggs/10ml urine)	-0,0213	1157	-0,0788	0,0364	0,4692
Signs-Malaria	log (eggs/g stool)	-0,0633	1640	-0,1114	-0,015	0,0103
Signs-Malaria	PolyPara	-0,0607	1927	-0,105	-0,016	0,0077
Signs-Malaria	Age	0,0351	1537	-0,015	0,0849	0,1694
Signs-Malaria	Nbr IEC	0,1207	2007	0,0774	0,1636	<,0001
Signs-Malaria	TOTAL POINTS-JMP	0,483	2007	0,4488	0,5159	<,0001
Signs-Schistosomiasis	log (eggs/10ml urine)	0,0148	1160	-0,0428	0,0723	0,6155
Signs-Schistosomiasis	log (eggs/g stool)	-0,0696	1643	-0,1175	-0,0213	0,0048
Signs-Schistosomiasis	PolyPara	-0,0243	1930	-0,0689	0,0203	0,2857
Signs-Schistosomiasis	Age	0,0797	1540	0,0298	0,1291	0,0018
Signs-Schistosomiasis	Nbr IEC	0,3345	2010	0,2951	0,3728	<,0001
Signs-Schistosomiasis	TOTAL POINTS-JMP	0,4389	2010	0,4029	0,4735	<,0001
Signs-Worm Infection	log (eggs/10ml urine)	0,0391	1160	-0,0185	0,0965	0,1828
Signs-Worm Infection	log (eggs/g stool)	-0,0653	1643	-0,1133	-0,017	0,0081
Signs-Worm Infection	PolyPara	-0,0234	1930	-0,068	0,0212	0,3034
Signs-Worm Infection	Age	0,1158	1540	0,0662	0,1648	<,0001
Signs-Worm Infection	Nbr IEC	0,1608	2010	0,1179	0,2031	<,0001
Signs-Worm Infection	TOTAL POINTS-JMP	0,3425	2010	0,3033	0,3805	<,0001
Signs-Tuberculosis	log (eggs/10ml urine)	-0,0004	1160	-0,0579	0,0572	0,9902
Signs-Tuberculosis	log (eggs/g stool)	-0,0457	1643	-0,0939	0,0026	0,0638
Signs-Tuberculosis	PolyPara	-0,0157	1930	-0,0602	0,029	0,4914
Signs-Tuberculosis	Age	0,0559	1540	0,006	0,1056	0,0282
Signs-Tuberculosis	Nbr IEC	0,3184	2010	0,2786	0,3571	<,0001

Signs-Tuberculosis	TOTAL POINTS-JMP	0,4552	2010	0,4198	0,4892	<,0001
Cure Malaria	log (eggs/10ml urine)	-0,0526	1160	-0,1098	0,005	0,0734
Cure Malaria	log (eggs/g stool)	-0,1137	1643	-0,1611	-0,0657	<,0001
Cure Malaria	PolyPara	-0,1107	1930	-0,1546	-0,0664	<,0001
Cure Malaria	Age	0,0083	1540	-0,0417	0,0582	0,7446
Cure Malaria	Nbr IEC	-0,0171	2010	-0,0608	0,0266	0,4437
Cure Malaria	TOTAL POINTS-JMP	0,4147	2010	0,3778	0,4502	<,0001
Cure Schistosomiasis	log (eggs/10ml urine)	-0,0349	1160	-0,0923	0,0227	0,2351
Cure Schistosomiasis	log (eggs/g stool)	-0,1575	1642	-0,2043	-0,1099	<,0001
Cure Schistosomiasis	PolyPara	-0,1541	1929	-0,1973	-0,1102	<,0001
Cure Schistosomiasis	Age	0,106	1538	0,0564	0,1552	<,0001
Cure Schistosomiasis	Nbr IEC	-0,0329	2008	-0,0765	0,0109	0,1405
Cure Schistosomiasis	TOTAL POINTS-JMP	0,4256	2008	0,3891	0,4608	<,0001
Cure Belly Worm Infection	log (eggs/10ml urine)	-0,0101	1160	-0,0676	0,0475	0,7314
Cure Belly Worm Infection	log (eggs/g stool)	-0,1712	1643	-0,2178	-0,1239	<,0001
Cure Belly Worm Infection	PolyPara	-0,1424	1930	-0,1859	-0,0984	<,0001
Cure Belly Worm Infection	Age	0,1484	1539	0,0992	0,1969	<,0001
Cure Belly Worm Infection	Nbr IEC	0,0401	2009	-0,0037	0,0837	0,0724
Cure Belly Worm Infection	TOTAL POINTS-JMP	0,4165	2009	0,3796	0,452	<,0001
Prevention of Malaria	log (eggs/10ml urine)	-0,0453	1160	-0,1026	0,0122	0,1227
Prevention of Malaria	log (eggs/g stool)	-0,1448	1642	-0,1919	-0,0971	<,0001
Prevention of Malaria	PolyPara	-0,1469	1929	-0,1903	-0,1029	<,0001
Prevention of Malaria	Age	0,1116	1538	0,062	0,1607	<,0001
Prevention of Malaria	Nbr IEC	-0,0313	2008	-0,075	0,0124	0,1606
Prevention of Malaria	TOTAL POINTS-JMP	0,4261	2008	0,3896	0,4613	<,0001
Prevention of Schistosomiasis	log (eggs/10ml urine)	-0,0099	1160	-0,0674	0,0477	0,7367
Prevention of Schistosomiasis	log (eggs/g stool)	-0,0973	1643	-0,145	-0,0492	<,0001
Prevention of Schistosomiasis	PolyPara	-0,0629	1930	-0,1072	-0,0183	0,0057
Prevention of Schistosomiasis	Age	0,0879	1539	0,0381	0,1373	0,0006
Prevention of Schistosomiasis	Nbr IEC	0,0605	2009	0,0168	0,104	0,0067
Prevention of Schistosomiasis	TOTAL POINTS-JMP	0,383	2009	0,345	0,4197	<,0001
Prevent Belly Worm Infection	log (eggs/10ml urine)	-0,0067	1160	-0,0642	0,0509	0,8198
Prevent Belly Worm Infection	log (eggs/g stool)	-0,1278	1643	-0,1751	-0,0799	<,0001
Prevent Belly Worm Infection	PolyPara	-0,0914	1930	-0,1355	-0,047	<,0001
Prevent Belly Worm Infection	Age	0,1513	1539	0,1021	0,1998	<,0001
Prevent Belly Worm Infection	Nbr IEC	0,0825	2009	0,0389	0,1258	0,0002
Prevent Belly Worm Infection	TOTAL POINTS-JMP	0,4103	2009	0,3733	0,4461	<,0001
Reason for Vaccination	log (eggs/10ml urine)	0,0276	1160	-0,03	0,085	0,3476
Reason for Vaccination	log (eggs/g stool)	0,0296	1643	-0,0188	0,0778	0,2311
Reason for Vaccination	PolyPara	0,0729	1930	0,0284	0,1171	0,0014
Reason for Vaccination	Age	0,0944	1540	0,0446	0,1436	0,0002
Reason for Vaccination	Nbr IEC	0,411	2010	0,374	0,4467	<,0001
Reason for Vaccination	TOTAL POINTS-JMP	0,4408	2010	0,4049	0,4754	<,0001
Nbr Known Vaccines	log (eggs/10ml urine)	0,0185	1160	-0,0391	0,076	0,5293
Nbr Known Vaccines	log (eggs/g stool)	-0,0419	1642	-0,0901	0,0065	0,0899
Nbr Known Vaccines	PolyPara	0,0051	1929	-0,0395	0,0498	0,8214

Nbr Known Vaccines	Age	0,0813	1539	0,0314	0,1307	0,0014
Nbr Known Vaccines	Nbr IEC	0,4653	2009	0,4303	0,4989	<,0001
Nbr Known Vaccines	TOTAL POINTS-JMP	0,5672	2009	0,5368	0,5962	<,0001
Vaccinated Yes/No	log (eggs/10ml urine)	0,0286	1091	-0,0308	0,0878	0,3449
Vaccinated Yes/No	log (eggs/g stool)	-0,0714	1599	-0,12	-0,0224	0,0043
Vaccinated Yes/No	PolyPara	-0,0425	1861	-0,0877	0,003	0,0669
Vaccinated Yes/No	Age	0,0315	1540	-0,0185	0,0813	0,2168
Vaccinated Yes/No	Nbr IEC	0,0893	1941	0,045	0,1332	<,0001
Vaccinated Yes/No	TOTAL POINTS-JMP	0,3415	1941	0,3016	0,3802	<,0001
Vaccinated what Disease	log (eggs/10ml urine)	0,0411	1160	-0,0165	0,0984	0,1621
Vaccinated what Disease	log (eggs/g stool)	0,0035	1643	-0,0449	0,0518	0,8882
Vaccinated what Disease	PolyPara	0,0293	1930	-0,0153	0,0739	0,1977
Vaccinated what Disease	Age	0,0473	1540	-0,0027	0,097	0,0637
Vaccinated what Disease	Nbr IEC	0,2631	2010	0,2219	0,3033	<,0001
Vaccinated what Disease	TOTAL POINTS-JMP	0,496	2010	0,4623	0,5283	<,0001
Know Vaccine TB+Polio	log (eggs/10ml urine)	0,0103	1160	-0,0473	0,0678	0,7265
Know Vaccine TB+Polio	log (eggs/g stool)	-0,0779	1643	-0,1258	-0,0296	0,0016
Know Vaccine TB+Polio	PolyPara	-0,0577	1930	-0,1021	-0,0131	0,0112
Know Vaccine TB+Polio	Age	0,0616	1540	0,0117	0,1112	0,0157
Know Vaccine TB+Polio	Nbr IEC	0,0422	2010	-0,0015	0,0858	0,0584
Know Vaccine TB+Polio	TOTAL POINTS-JMP	0,4315	2010	0,3953	0,4665	<,0001
Definition VIH+SIDA	log (eggs/10ml urine)	0,033	1160	-0,0246	0,0904	0,2607
Definition VIH+SIDA	log (eggs/g stool)	-0,0054	1642	-0,0538	0,0429	0,8257
Definition VIH+SIDA	PolyPara	0,0451	1929	0,0004	0,0895	0,0478
Definition VIH+SIDA	Age	0,111	1538	0,0614	0,1601	<,0001
Definition VIH+SIDA	Nbr IEC	0,4112	2008	0,3742	0,4469	<,0001
Definition VIH+SIDA	TOTAL POINTS-JMP	0,4707	2008	0,4359	0,504	<,0001
Contraction of VIH/SIDA	log (eggs/10ml urine)	-0,0115	1160	-0,069	0,0461	0,6947
Contraction of VIH/SIDA	log (eggs/g stool)	-0,0956	1643	-0,1433	-0,0474	0,0001
Contraction of VIH/SIDA	PolyPara	-0,085	1930	-0,1291	-0,0405	0,0002
Contraction of VIH/SIDA	Age	0,1264	1540	0,0769	0,1752	<,0001
Contraction of VIH/SIDA	Nbr IEC	0,112	2010	0,0686	0,155	<,0001
Contraction of VIH/SIDA	TOTAL POINTS-JMP	0,4906	2010	0,4566	0,5231	<,0001
Prevention of VIH/SIDA	log (eggs/10ml urine)	-0,0307	1160	-0,0881	0,0269	0,2964
Prevention of VIH/SIDA	log (eggs/g stool)	-0,1721	1643	-0,2187	-0,1248	<,0001
Prevention of VIH/SIDA	PolyPara	-0,1526	1930	-0,1959	-0,1087	<,0001
Prevention of VIH/SIDA	Age	0,1326	1540	0,0832	0,1813	<,0001
Prevention of VIH/SIDA	Nbr IEC	0,0023	2010	-0,0414	0,046	0,9185
Prevention of VIH/SIDA	TOTAL POINTS-JMP	0,4866	2010	0,4525	0,5193	<,0001
Necassity to wash fruits?	log (eggs/10ml urine)	-0,0149	1151	-0,0727	0,0429	0,6125
Necassity to wash fruits?	log (eggs/g stool)	-0,0421	1637	-0,0903	0,0064	0,0888
Necassity to wash fruits?	PolyPara	-0,0336	1921	-0,0782	0,0111	0,1406
Necassity to wash fruits?	Age	-0,0463	1540	-0,0961	0,0036	0,0692
Necassity to wash fruits?	Nbr IEC	0,0401	2001	-0,0037	0,0838	0,0731
Necassity to wash fruits?	TOTAL POINTS-JMP	0,2956	2001	0,2551	0,3351	<,0001
MosquitoNet at Home?	log (eggs/10ml urine)	0,0257	1154	-0,032	0,0833	0,3824

MosquitoNet at Home?	log (eggs/g stool)	-0,0913	1639	-0,1391	-0,0431	0,0002
MosquitoNet at Home?	PolyPara	-0,0377	1924	-0,0822	0,007	0,0983
MosquitoNet at Home?	Age	0,1246	1540	0,0752	0,1735	<,0001
MosquitoNet at Home?	Nbr IEC	0,2615	2004	0,2202	0,3018	<,0001
MosquitoNet at Home?	TOTAL POINTS-JMP	0,3329	2004	0,2934	0,3713	<,0001
Sleep under MosquitoNet?	log (eggs/10ml urine)	0,0197	1160	-0,0379	0,0772	0,5023
Sleep under MosquitoNet?	log (eggs/g stool)	0,0635	1643	0,0152	0,1115	0,01
Sleep under MosquitoNet?	PolyPara	0,0471	1930	0,0025	0,0915	0,0385
Sleep under MosquitoNet?	Age	-0,1256	1540	-0,1744	-0,0761	<,0001
Sleep under MosquitoNet?	Nbr IEC	-0,268	2010	-0,3081	-0,2269	<,0001
Sleep under MosquitoNet?	TOTAL POINTS-JMP	-0,2097	2010	-0,2512	-0,1676	<,0001
Reason for Body Hygine?	log (eggs/10ml urine)	0,0465	1160	-0,0111	0,1037	0,1138
Reason for Body Hygine?	log (eggs/g stool)	0,0297	1643	-0,0187	0,0779	0,229
Reason for Body Hygine?	PolyPara	0,0744	1930	0,0299	0,1186	0,0011
Reason for Body Hygine?	Age	0,1403	1540	0,091	0,189	<,0001
Reason for Body Hygine?	Nbr IEC	0,5183	2010	0,4856	0,5496	<,0001
Reason for Body Hygine?	TOTAL POINTS-JMP	0,4393	2010	0,4034	0,474	<,0001
ReasonHygieneSchool/Home?	log (eggs/10ml urine)	0,0299	1160	-0,0277	0,0873	0,3088
ReasonHygieneSchool/Home?	log (eggs/g stool)	-0,0134	1643	-0,0617	0,035	0,5883
ReasonHygieneSchool/Home?	PolyPara	0,0541	1930	0,0095	0,0985	0,0175
ReasonHygieneSchool/Home?	Age	0,1347	1540	0,0853	0,1834	<,0001
ReasonHygieneSchool/Home?	Nbr IEC	0,6274	2010	0,6002	0,6532	<,0001
ReasonHygieneSchool/Home?	TOTAL POINTS-JMP	0,5042	2010	0,4709	0,5361	<,0001
Reason for hot body?	log (eggs/10ml urine)	0,0375	1160	-0,0201	0,0949	0,2019
Reason for hot body?	log (eggs/g stool)	-0,0351	1643	-0,0833	0,0133	0,1553
Reason for hot body?	PolyPara	0,003	1930	-0,0416	0,0476	0,8949
Reason for hot body?	Age	0,1569	1540	0,1078	0,2052	<,0001
Reason for hot body?	Nbr IEC	0,3198	2010	0,2799	0,3585	<,0001
Reason for hot body?	TOTAL POINTS-JMP	0,4755	2010	0,4409	0,5086	<,0001
Reason for big belly?	log (eggs/10ml urine)	0,0165	1160	-0,0411	0,074	0,5739
Reason for big belly?	log (eggs/g stool)	0,0085	1643	-0,0399	0,0568	0,7306
Reason for big belly?	PolyPara	0,0381	1930	-0,0065	0,0826	0,0943
Reason for big belly?	Age	0,108	1540	0,0584	0,1571	<,0001
Reason for big belly?	Nbr IEC	0,3161	2010	0,2762	0,3549	<,0001
Reason for big belly?	TOTAL POINTS-JMP	0,5035	2010	0,4701	0,5354	<,0001
Reason for bloody urine?	log (eggs/10ml urine)	0,0163	1160	-0,0413	0,0738	0,5796
Reason for bloody urine?	log (eggs/g stool)	0,0274	1643	-0,0209	0,0757	0,2663
Reason for bloody urine?	PolyPara	0,0599	1930	0,0154	0,1043	0,0084
Reason for bloody urine?	Age	0,1378	1540	0,0885	0,1865	<,0001
Reason for bloody urine?	Nbr IEC	0,4747	2010	0,4401	0,5079	<,0001
Reason for bloody urine?	TOTAL POINTS-JMP	0,5805	2010	0,5507	0,6087	<,0001
Reason for vomiting?	log (eggs/10ml urine)	0,0291	1160	-0,0285	0,0866	0,3214
Reason for vomiting?	log (eggs/g stool)	0,0205	1643	-0,0279	0,0687	0,4073
Reason for vomiting?	PolyPara	0,0799	1930	0,0354	0,1241	0,0004
Reason for vomiting?	Age	0,0552	1540	0,0052	0,1048	0,0304
Reason for vomiting?	Nbr IEC	0,5586	2010	0,5277	0,5879	<,0001

Reason for vomiting?	TOTAL POINTS-JMP	0,5623	2010	0,5317	0,5915	<,0001
Reason for diarrhea?	log (eggs/10ml urine)	0,0434	1160	-0,0141	0,1007	0,1392
Reason for diarrhea?	log (eggs/g stool)	0,0312	1643	-0,0172	0,0795	0,2058
Reason for diarrhea?	PolyPara	0,1061	1930	0,0618	0,15	<,0001
Reason for diarrhea?	Age	0,0714	1540	0,0215	0,1209	0,0051
Reason for diarrhea?	Nbr IEC	0,6284	2010	0,6012	0,6541	<,0001
Reason for diarrhea?	TOTAL POINTS-JMP	0,6273	2010	0,6	0,6531	<,0001
Reason for cough?	log (eggs/10ml urine)	0,0381	1160	-0,0195	0,0955	0,1947
Reason for cough?	log (eggs/g stool)	-0,0027	1643	-0,0511	0,0457	0,9124
Reason for cough?	PolyPara	0,078	1930	0,0335	0,1222	0,0006
Reason for cough?	Age	0,1717	1540	0,1228	0,2198	<,0001
Reason for cough?	Nbr IEC	0,7233	2010	0,7017	0,7435	<,0001
Reason for cough?	TOTAL POINTS-JMP	0,605	2010	0,5766	0,632	<,0001
How to attract typhoid fever?	log (eggs/10ml urine)	0,0679	702	-0,0061	0,1412	0,072
How to attract typhoid fever?	log (eggs/g stool)	-0,0341	1352	-0,0872	0,0193	0,2104
How to attract typhoid fever?	PolyPara	0,0194	1467	-0,0318	0,0705	0,4584
How to attract typhoid fever?	Age	0,1446	1540	0,0954	0,1932	<,0001
How to attract typhoid fever?	Nbr IEC	0,3501	1547	0,3056	0,3931	<,0001
How to attract typhoid fever?	TOTAL POINTS-JMP	0,5026	1547	0,4644	0,539	<,0001
School Absent bcs disease	log (eggs/10ml urine)	-0,0386	702	-0,1123	0,0355	0,3074
School Absent bcs disease	log (eggs/g stool)	-0,0272	1351	-0,0804	0,0262	0,3177
School Absent bcs disease	PolyPara	-0,0142	1466	-0,0653	0,0371	0,588
School Absent bcs disease	Age	0,082	1538	0,0322	0,1315	0,0013
School Absent bcs disease	Nbr IEC	0,2654	1545	0,2184	0,3112	<,0001
School Absent bcs disease	TOTAL POINTS-JMP	0,3192	1545	0,2737	0,3633	<,0001
School Absent how often?	log (eggs/10ml urine)	-0,0187	702	-0,0926	0,0553	0,6201
School Absent how often?	log (eggs/g stool)	0,0502	1350	-0,0031	0,1033	0,065
School Absent how often?	PolyPara	-0,0176	1465	-0,0687	0,0337	0,5018
School Absent how often?	Age	-0,1781	1537	-0,2261	-0,1293	<,0001
School Absent how often?	Nbr IEC	-0,6574	1544	-0,6848	-0,6281	<,0001
School Absent how often?	TOTAL POINTS-JMP	-0,4377	1544	-0,4772	-0,3965	<,0001

11.2 Registration form for stool and urine sample examination

EPP:											Date:					
Selles: Etat frais										Urine oeufs/10ml	Kato-Katz oeufs/g de selles					
No.	Sign	Anky. duod.	Schist mans.	Hy mna na	Larve ang.	Amibe	Giard. lamb.	Trich intest.	Autres	S. haemat.	No.	Sign.	Anky. duod.	Schist. mans.	Hym. nana	Autres
No.	Sign	Anky. duod.	Schist mans.	Hy mna na	Larve ang.	Amibe	Giard. lamb.	Trich intest.	Autres	S. haemat.	No.	Sign.	Anky. duod.	Schist. mans.	Hym. nana	Autres
No.	Sign	Anky. duod.	Schist mans.	Hy mna na	Larve ang.	Amibe	Giard. lamb.	Trich intest.	Autres	S. haemat.	No.	Sign.	Anky. duod.	Schist. mans.	Hym. nana	Autres

Table 16. Stool and Urines samples Examination Results registration form

11.3 Prevalence of parasite infections and hemoglobin levels in some public primary schools in the central region in Togo

Nom EPP (n=16)	Date	Ankylostoma Prevalence (%)	Amibes Prevalence (%)	Giardia Prevalence (%)	Trichomonas Prevalence (%)	Schistosoma haematob. Prevalence (%)	Taux Hemoglobin Moyenne (g/dl)
Affem-Boussou	25.07.2010	66,7	66,7	3,3	6,7	0	11,34
Affem-Kabye	25.07.2010	40	60	13,3	6,7	3,3	11,55
Afoule	09.08.2010	20	53,3	0	3,3	6,7	11,18
Bila	08.08.2010	20	50	3,3	13,3	0	12,23
Dantcho	01.08.2010	51,9	44,4	3,7	11,1	3,6	11,57
Kpatakpani	26.07.2010	50	36,7	3,3	3,3	30	11,24
Larini	26.07.2010	52	48	4	4	7,1	11,94
Mono	10.08.2010	66,7	40	3,3	6,7	3,3	10,34
N'Kognon	02.08.2010	40	36,7	13,3	30	6,7	11,95
N'Tsourou I	03.11.2010	76	40	8	8	3,3	11,98
N'Tsourou II	03.11.2010	84	48	4	8	3,3	11,65
Nandjoubi	03.08.2010	36,7	26,7	6,7	3,3	0	11,79
Oronko	10.08.2010	30	30	10	3,3	0	12,33
Oudjomboi	28.07.2010	33,3	70	6,7	6,7	6,7	11,62
Samai	09.08.2010	20	36,7	3,3	3,3	0	12,08
Teheza	07.08.2010	30	53,3	0	3,3	6,7	10,82
		42,6					

Table 17. Prevalence of parasite infections and hemoglobin levels in some EPPs of central region in Togo

11.4 Posters for Health education in public primary schools

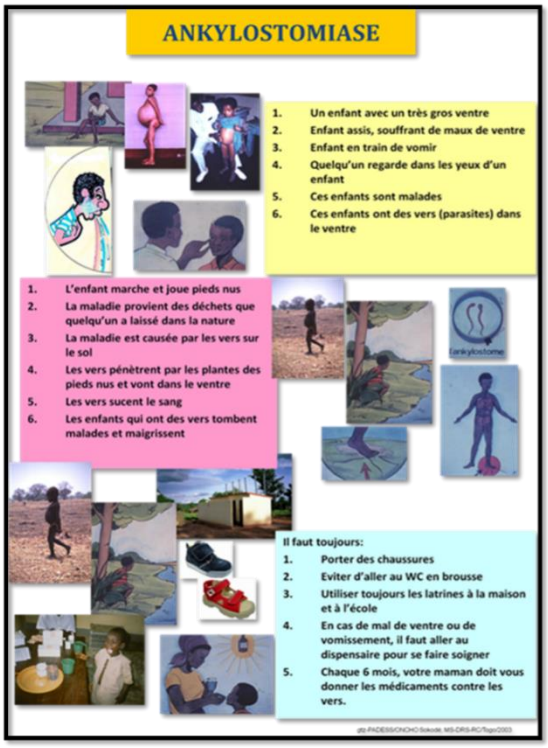


Figure 63. ***Figure 64.***

Figure 63. Poster on Hookworm infection, (disease, Cause and prevention)

Hookworm infection is caused by a parasitic blood-sucking roundworm. Hookworm infections include ancylostomiasis and necatoriasis. These worms live in the small intestine of human. Hookworm infection in pregnancy can cause poor growth, premature birth and a low birth weight of the baby. Hookworms in children can cause intellectual and growth problems. The most significant risk of hookworm infection is anemia, loss of iron and proteins. The worms suck blood and damage the mucosa. However, the blood loss in the stools is not visibly apparent.

Figure 64.Poster on Ascaris infection, (disease, Cause and prevention)

Ascariasis is a disease caused by a parasitic roundworm Ascaris lumbricoides. This infection occurs by eating food or drink liquids contaminated with Ascaris eggs from feces. This infection may cause no symptoms in more than 85% of cases, especially if the number of worms is small. Symptoms increase with the number of worms present and may include shortness of breath and fever in the beginning of the disease. These may be followed by symptoms of abdominal swelling, abdominal pain, and diarrhea. Children are most commonly affected, and in this age group the infection may also cause poor weight gain, malnutrition, and learning problems.

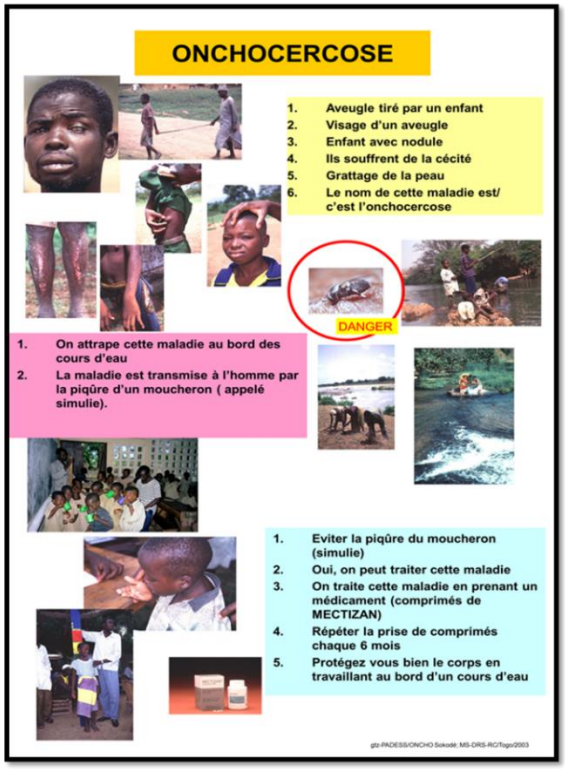


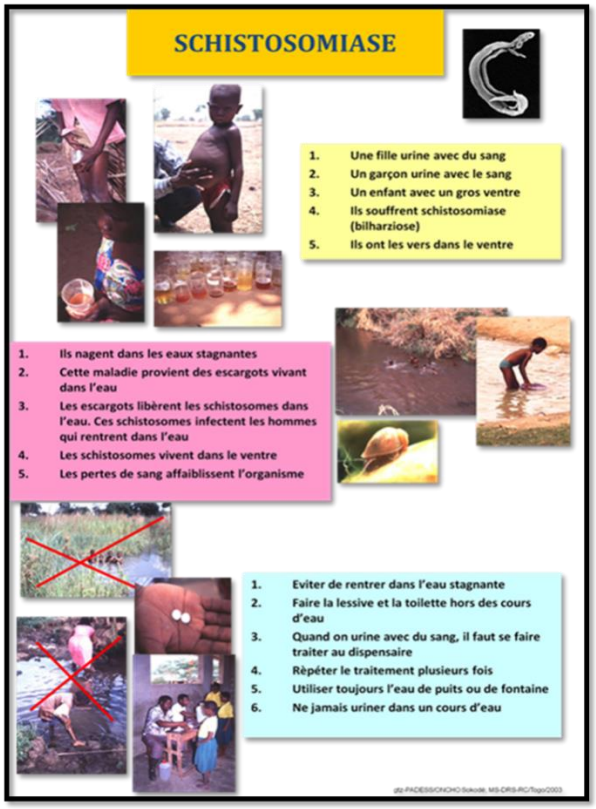
Figure 65. ***Figure 66.***

Figure 65. Poster on hygiene aspects in schools

School hygiene or school hygiene education is an important aspect of healthcare, and should be part of the wider school health education. The primary aims of school hygiene education is to improve behavior through useful practices connected to personal, water, food, domestic and public hygiene. Also, it aims to protect water and food supplies and to safely manage environmental factors in and around schools.

Figure 66. Poster on onchocerciasis, (disease, Cause and prevention)

Onchocerciasis, also known as river blindness, is a disease caused by infection with a parasitic worm, *Onchocerca volvulus*. Symptoms include severe itching, nodules under the skin, and visual impairment up to blindness. It is the second most common cause of blindness after trachoma. The parasite is transmitted by the bites of a black fly of the *Simulium genus*. Usually, many bites are required before the infection occurs. The black flies live near rivers, hence the name of the disease.



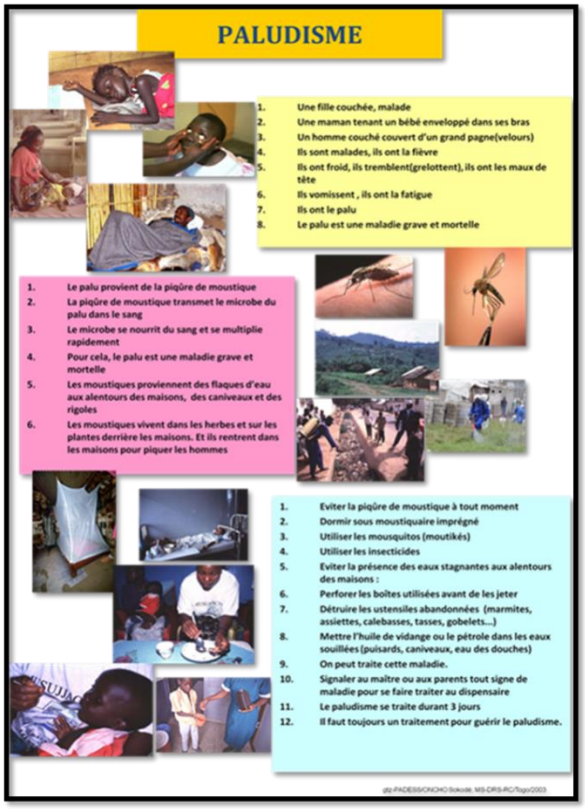


Figure 67. ***Figure 68.***

Figure 67. Poster on schistosomiasis, (disease, Cause and prevention)

Schistosomiasis, also known as snail fever and bilharziasis, is a disease caused by a parasitic flatworms called *Schistosoma spp*. The urinary tract or the intestines may be infected. Signs and symptoms may include abdominal pain, diarrhea, bloody stool, or blood in the urine. Those who have been infected for a long time may have liver damage, kidney failure, infertility, or bladder cancer. In children, it may cause poor growth and cognitive impairment.

Figure 68. Poster on malaria, (disease, Cause and prevention)

Malaria is a mosquito-borne infectious disease affecting humans; it is caused by a protozoan parasite. Malaria causes symptoms that typically include fever, fatigue, vomiting, and headaches. In severe cases it can cause jaundice, seizures, coma, or death. The parasite is transmitted to human by the bite of an Anopheles mosquito and symptoms usually begin ten to fifteen days after being bitten.

Figure 69. ***Figure 70.***

Figure 69. Poster on Tuberculosis, (disease, Cause and prevention)

Tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis* (MTB). Tuberculosis generally affects the lungs, but can also affect other parts of the body. Most infections do not have symptoms, in which case it is known as latent tuberculosis. About 10% of latent infections progress to active disease which, if left untreated, kills 50% of those infected. The classic symptoms of active TB are a chronic cough with blood-containing sputum, fever, night sweats, and weight loss.

Figure 70. Poster on HIV/AIDS, (disease, Cause and prevention)

Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) is a spectrum of conditions caused by infection with the human immunodeficiency virus (HIV). Following initial infection, a person may not notice any symptoms or may experience a brief period of influenza-like illness. As the infection progresses, it interferes and suppresses the immune system, increasing the risk of common infections like tuberculosis, as well as other opportunistic infections, and tumors that rarely affect people who have a competent immune systems. These late symptoms of infection are referred to as AIDS. This stage is often also associated with weight loss.

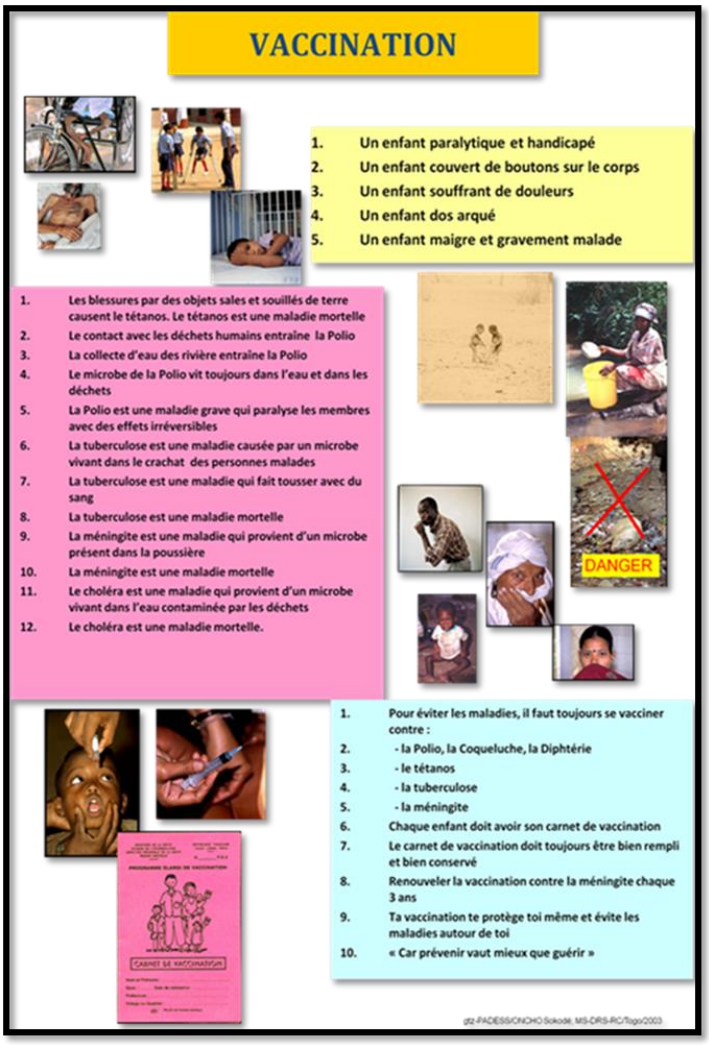


Figure 71. Poster on Vaccinations, vaccine application and use against disease

Vaccination is the administration of antigenic material (a vaccine) to stimulate an individual's immune system to develop adaptive immunity to a pathogen. Vaccines can prevent or ameliorate morbidity from infection. When a sufficiently large percentage of a population has been vaccinated, this results in herd immunity. Vaccination is the most effective method of preventing infectious diseases. Vaccination is largely responsible for the worldwide eradication of smallpox and diseases control such as polio, measles, and tetanus.

11.5 Education manual for hygiene and health education in public primary schools

MANUEL DE COMMUNICATION POUR LE CHANGEMENT DE COMPORTEMENT EN SANTE

A l'Usage des Elèves du Cours Primaire

SOMMAIRE **PAGE**

JUSTIFICATION

L'édition de cette brochure s'inscrit dans le cadre global de la politique nationale des soins de santé primaires afin d'améliorer le bien être de la santé des populations.

La GTZ/PADESS, dans le souci d'appuyer les stratégies de lutte contre les maladies de la pauvreté comme le paludisme, les parasitoses, le SIDA, la tuberculose, les maladies diarrhéiques etc. dans la Région Centrale, a par le Laboratoire ONCHO encouragé la réalisation de cette brochure.

Un sondage auprès des enseignants révèle que les élèves souffrent des problèmees de fièvre, de diarrhée, de vomissement. Les enseignants et les élèves ont manifesté un besoin d'information dans le domaine de la santé.

Une analyse parasitologique chez les élèves de quelques écoles de la préfecture de Tchaoudjo au laboratoire du CHR de Sokodé a révélé un résultat fortement positif en parasitoses intestinales et bilharziose vésicale.

Exemple : bilharziose vésicale (38,02 %)

Nous avons alors entrepris un déparasitage systématique de tous les élèves et un traitement de tous les élèves atteints de bilharziose vésicale. Une sensibilisation pour le changement de comportement idéal est nécessaire pour renforcer l'action de déparasitage menée sur le terrain.

La conception et la finalisation de ce document a été rendue possible grâce aux travaux d'une équipe de la Direction Régionale de la Santé, de la Direction Préfectorale de la Santé de Sokodé et du Laboratoire de Réference ONCHO de l'Istitut pour la Médécine Tropical a l'Université de Tübingen en Allemagne. La liste se trouve en annexe.

PRINCIPES GENERAUX

I – Objectif du manuel

Il s'agit de mettre à la disposition des enseignants et des élèves des supports éducatifs devant leur permettant d'adopter un comportement idéal face aux problèmes de santé et particulièrement d'hygiène dans leur milieu de vie.

II - Contenu du manuel

Le manuel aborde les domaines suivants:

1. L'hygiène en milieu scolaire
2. Les parasitoses (ankylostomiase, schistosomiase, ascaridiose)
3. Le VIH/SIDA et la Tuberculose
4. La vaccination
5. Le Paludisme
6. L'onchocercose

III - Matériel proposé

- Les affiches éducatives

Elles sont regroupées en série de 9 résumant les thèmes élaborés. Elles comprennent : des photos auxquelles sont associés des questionnaires d'éveil pour amener les élèves à s'interroger sur ce qu'ils observent et vivent quotidiennement.

- Le manuel d'IEC/CCC

Ce manuel comporte les thèmes jugés nécessaires pour l'éducation des élèves en matière de santé. Il comprend pour chaque thème les questions d'éveil et les réponses sur chaque photo ou gravure que comporte les affiches éducatives.

Ces deux éléments : série d'affiches et le manuel d'IEC/CCC sont complémentaires et renforcent la compréhension de l'utilisateur.

IV - Utilisation du matériel et méthode pédagogique.

Pour l'utilisation, il est recommandé que l'utilisateur ou l'enseignant cache les réponses et le titre sur l'affiche avant de poser les questions d'éveil aux élèves. L'enseignant recueille les réponses des élèves bonnes ou mauvaises. Puis il fait la lumière sur cette partie en faisant voir les réponses aux élèves avec des explications.

A la fin, l'enseignant reprend le résumé enchaîné pour les enfants.

Déroulement pédagogique de chaque séance

1 - Le questionnaire d'éveil

Il est très important pour sensibiliser les élèves. Il doit permettre à chaque élève d'exprimer ce qu'il connaît et ce qu'il pense sur les images que comporte l'affiche. Le rôle de l'enseignant est de veiller à l'expression de tous, d'écouter et de noter. Pour faciliter le travail, le questionnaire peut être écouté par l'ensemble de la classe ou par rangée suivant la disposition en salle ensuite l'enseignant fera une mise en commun.

2 – Présentation des thèmes et des affiches

Composition des thèmes
Le thèmes est énoncé au-dessus de chaque page. En dessous, les images d'illustration en face desquelles se trouvent les questions-réponses.

3 - La composition des affiches

Chaque affiche est composée de trois parties: manifestations, causes et prévention de la maladie. Ces trois parties sont illustrées en images-messages.

Plan de rédaction des affiches

Images problème ou maladie (garçon malade)	(Texte 1) 1-Que voyez vous sur cette image ? 2-Quels signes voyez vous ? 3-De quoi souffre t –il ? Questions complémentaires 1-Avez vous une fois vu cette maladie 2-Connaissez vous quelqu'un qui a souffert de cette maladie ?
Images causes (l'eau contaminée)	(Texte 2) 1-Pourquoi cette maladie ? D'où provient cette maladie ? 2-Comment l'attrape t on ? 3-Qu'est ce qui cause cette maladie? 4-Quelles sont les manifestations de la maladie ? 5- Comment sait on qu'on est souffre de cette maladie ? Questions complémentaires 1-Pouvez vous reconnaître quelqu'un qui souffre de cette maladie ?
Images Prévention- Solutions	(Texte 3) 1-Comment peut on éviter cette maladie ? 2-Peut on traiter cette maladie ? Comment ? 3-Où peut on guérir cette maladie ? 4-Par quels moyens peut on éviter cette maladie ? Questions complémentaires 1-Utilisez vous ces moyens à la maison ? 2-Connaissez vous quelqu'un qui utilise ces moyens ? 3-Aimeriez vous utiliser ces moyens ? 4-Comment pourriez vous les obtenir ?

PALUDISME

1. Image d'un muostique en train de piquer
2. Une fille couchée, malade
3. Ils ont froid, ils tremblent (grelottent), ils ont les maux de tête
4. Ils vomissent , ils ont la fatigue
5. Ils ont le palu
6. Le palu est une maladie grave et mortelle !

1. Le palu provient de la piqûre de moustique
2. La piqûre de moustique transmet le microbe du palu dans le sang
3. Les moustiques proviennent des flaques d'eau aux alentours des maisons, des caniveaux et des rigoles
4. Les moustiques vivent dans les herbes et sur les plantes derrière les maisons. Et ils rentrent dans les maisons pour piquer les hommes

1. Eviter la piqûre de moustique à tout moment
2. Dormir sous moustiquaire imprégné
3. Utiliser les insecticides
4. Eviter la présence des eaux stagnantes aux alentours des maisons (puisards, caniveaux, eau des douches)
5. Détruire les ustensiles abandonnées (marmites, assiettes, calebasses, tasses, gobelets...)
6. On peut traite le paludisme
7. Signaler au maître ou aux parents tout signe de maladie pour se faire traiter au dispensaire

gtc-PADESSIONCHO Sokodé, MS-DRS-RC/Togo/2003

LE PALUDISME

I - La maladie

Que voyez vous sur ces images ?

- Un moustique pique un homme
- Une fillette couchée, fatiguée
- Un enfant qui vomit
- Un enfant à qui on écarquille les yeux
- Un homme a les maux de tête

Que pensez vous de ces images ?

- L'homme piqué par le moustique sera malade
- Une fillette couchée, malade et fatiguée
- Un enfant malade aux yeux pâle
- Cet enfant qui vomit est malade

De quoi souffrent ils ?

Ils ont le paludisme

II - Les causes

Comment attrape-t-on le paludisme ?

- Par la piqûre du moustique
- La piqûre du moustique (anophèle femelle) transmet le microbe (plasmodium) du paludisme dans le sang

D'où proviennent les moustiques ?

- Les moustiques proviennent des flaques d'eau aux alentours des maisons des caniveaux des rigoles, des marres, des récipients abandonnées renfermant de l'eau.
- Les moustiques quittent les eaux viennent et vivent sur les herbes, sur les plantes derrière les maisons. Le soir où la nuit ils rentrent dans les maisons pour rentrer dans les chambres et piquer les hommes

III – Prévention

Comment peut on éviter le paludisme ?

- Il faut éviter la piqûre du moustique à tout moment
- Il faut dormir sous moustiquaire imprégnée
- Eviter la présence des eaux stagnantes aux alentours des maisons
- Perforer les boîtes utilisées avant de les jeter, détruire les ustensiles abandonnés (marmites, assiettes, calebasses, tasses, gobelets...)
- Signaler aux maîtres ou aux parents tout signe de maladie pour se faire traiter au dispensaire

Peut on traiter le paludisme ?

On peut traiter le paludisme avec de la chloroquine.

Résumé

Le paludisme est une maladie très grave causée par un parasite du sang appelé Plasmodium falciparum. Il est transmis à l'homme bien portant par la piqûre d'un moustique, anophèle femelle. Les signes du paludisme sont : le corps chaud (fièvre), des maux de tête, des frissons (le malade grelotte). Pour guérir du paludisme, on prend le médicament prescrit par un agent de santé. Pour éviter le paludisme, il faut détruire les oeufs (les larves) des moustiques, tuer les moustiques, dormir sous une moustiquaire imprégnée.

CE QUE JE DOIS RETENIR :

1. Le paludisme est causé seulement par la piqûre des moustiques
2. Je dois me protéger pour éviter le piqûres de moustiques
3. Pour éviter le paludisme il faut dormir sous une moustiquaire imprégnée
4. Renverser les eaux contenues dans les boîtes et les marmites abandonnées
5. Je mets la propreté aux alentours de ma maison pour éviter les moustiques

ASCARIDIOSE

I – Maladie

Que voyez vous sur ces images ?

- Une image de deux vers (ascaris)
- Il y a un enfant qui a mal au ventre
- Un enfant vomit
- Un enfant se gratte l'anus
- Un enfant a le ventre gros et ballonné

De quoi souffrent ils ?

Ils souffrent des vers intestinaux, ce sont des parasitoses

Avez vous vu une fois cette maladie ?

II – Causes

Comment attrape-t-on cette maladie?

On attrape cette maladie :
- en mangeant de la nourriture sale
- en mangeant avec des mains sales non lavées
- en mangeant des fruits non lavés,
- en mangeant avec des cuillères non lavées,
- en mangeant des légumes et des salades non lavées,
- en buvant l'eau de rivières non filtrée,
- en mangeant des aliments tombés par terre
- en se salissant les mains avec les déchets humains,
- en manquant de se laver les mains au savon après le WC
- en allant chercher les objets abandonnés au dépotoir.

Les ascaris prennent les vitamines que nous avons dans les aliments en suçant notre sang. Ainsi, on devient anémié (manque de sang), on tombe malade et on meurt si on n'est pas bien traité.

III – Prévention

Comment éviter cette maladie ?

Pour éviter cette maladie, il faut :
- se laver les mains avec du savon avant de manger,
- se laver les mains au savon après le WC,
- bien laver les fruits, les salades et les légumes avant de les manger
- bien laver les ustensiles de cuisine (assiettes, marmites, couteaux, cuillères, calebasses, gobelets, verres...)
- boire de l'eau propre, eau de robinet, eau filtrée ou traitée à l'eau de javel
- puiser l'eau propre dans des récipients couverts,
- aller au WC dans les latrines,
- éviter d'aller prendre les objets abandonnés au dépotoir,
- ne jamais manger les nourritures tombées par terre,
- éviter que les animaux entrent dans la cuisine,
- aller au dispensaire quand on vomit ou on au ventre pour se faire soigner.

Encourager ceux qui ont le ventre ballonné ou ceux qui se grattent dans l'anus à aller au dispensaire pour se faire soigner.

Peut on traiter cette maladie ?

Oui, on peut traiter cette maladie.

Par quels moyens peut guérir cette maladie ?

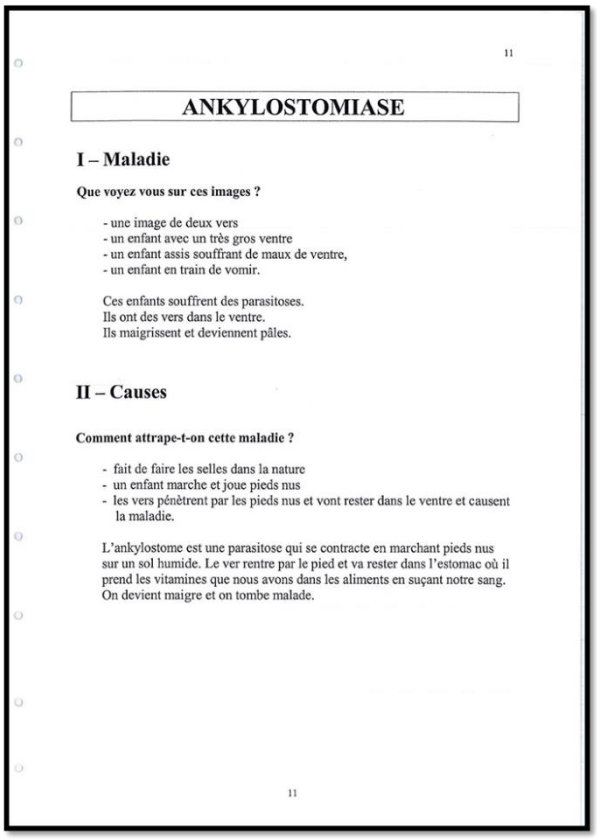
Résumé

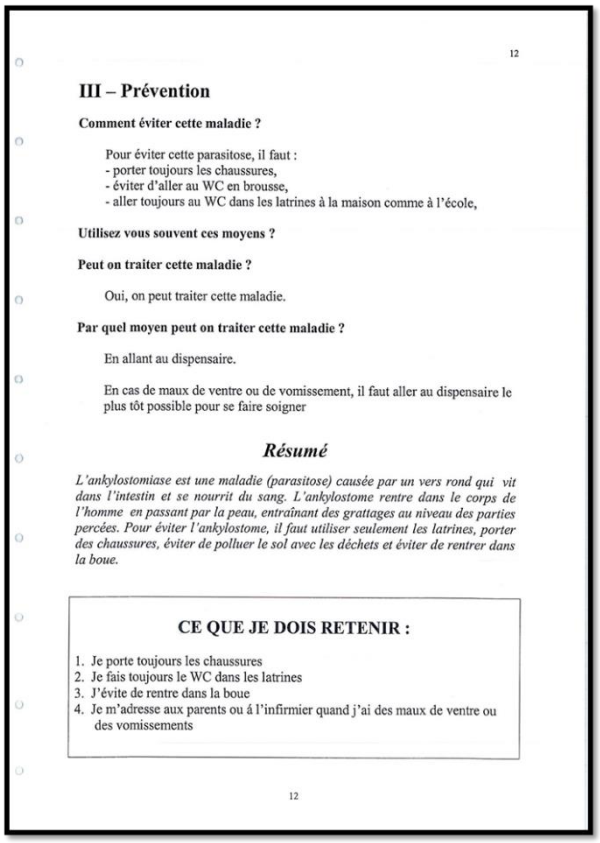
L'ascaridiose est une maladie (parasitose) causée par un vers rond de grande taille d'environ 25 à 30 cm appelé ascaris. Il se présente à l'état adulte dans l'intestin grêle et vit des aliments que nous mangeons et provoque des douleurs abdominales (maux de ventre, vomissements, ventre ballonné, ulticaires, anémie etc). Pour éviter l'ascaridiose, il faut pratiquer les règles d'hygiène alimentaire comme : se laver les mains avant de manger, couvrir les repas, laver les légumes, boire de l'eau filtrée ou traitée etc.

CE QUE JE DOIS RETENIR :

1. Je me lave toujours les mains au savon avant de manger et après le WC
2. Je lave toujours les fruits avant de les manger
3. Je bois toujours de l'eau propre
4. Je me lave les mains au savon après avoir touché un animal
5. Je m'adresse aux parents ou á l'infirmier quand j'ai des maux de ventre ou des vomissements


ANKYLOSTOMIASE
1
l'ankylostome
2
3
4
1. Un image avec deux vers
2. Un enfant avec un très gros ventre
3. Enfant assis souffrant de maux de ventre
4. Enfant en train de vomir
5. Ces enfants sont malades
6. Ces enfants ont des vers dans le ventre.
1. L'enfant marche et joue pieds nus
2. La maladie provient des déchets que quelqu'un a laissé dans la nature
3. La maladie est causée par les vers sur le sol
4. Les vers pénètrent par les pieds nus et vont rester dans le ventre et cause la maladie.
5. Les vers sucent le sang
6. Les enfants qui ont des vers tombent malades et maigrissent
Pour éviter l'ankylostomiase, il faut:
• Porter toujours des chaussures
• Eviter d'aller au WC en brousse
• Utiliser toujours le WC ou les latrines à la maison comme à l'école
• En cas de maux de ventre ou vomissement, il faut aller au dispensaire pour se faire soigner
• Prenez les médicaments contre les vers !
gtz-PADESS/ONCHO Sokodé, MS-DRS-RC/Togo/2003


11
ANKYLOSTOMIASE
I – Maladie
Que voyez vous sur ces images ?
- une image de deux vers
- un enfant avec un très gros ventre
- un enfant assis souffrant de maux de ventre,
- un enfant en train de vomir.
Ces enfants souffrent des parasitoses.
Ils ont des vers dans le ventre.
Ils maigrissent et deviennent pâles.
II – Causes
Comment attrape-t-on cette maladie ?
- fait de faire les selles dans la nature
- un enfant marche et joue pieds nus
- les vers pénètrent par les pieds nus et vont rester dans le ventre et causent la maladie.
L'ankylostome est une parasitose qui se contracte en marchant pieds nus sur un sol humide. Le ver rentre par le pied et va rester dans l'estomac où il prend les vitamines que nous avons dans les aliments en suçant notre sang. On devient maigre et on tombe malade.
11


12
III – Prévention
Comment éviter cette maladie ?
Pour éviter cette parasitose, il faut :
- porter toujours les chaussures,
- éviter d'aller au WC en brousse,
- aller toujours au WC dans les latrines à la maison comme à l'école,
Utilisez vous souvent ces moyens ?
Peut on traiter cette maladie ?
Oui, on peut traiter cette maladie.
Par quel moyen peut on traiter cette maladie ?
En allant au dispensaire.
En cas de maux de ventre ou de vomissement, il faut aller au dispensaire le plus tôt possible pour se faire soigner
Résumé
L'ankylostomiase est une maladie (parasitose) causée par un vers rond qui vit dans l'intestin et se nourrit du sang. L'ankylostome rentre dans le corps de l'homme en passant par la peau, entraînant des grattages au niveau des parties percées. Pour éviter l'ankylostome, il faut utiliser seulement les latrines, porter des chaussures, éviter de polluer le sol avec les déchets et éviter de rentrer dans la boue.
CE QUE JE DOIS RETENIR :
1. Je porte toujours les chaussures
2. Je fais toujours le WC dans les latrines
3. J'évite de rentre dans la boue
4. Je m'adresse aux parents ou á l'infirmier quand j'ai des maux de ventre ou des vomissements
12


SCHISTOSOMIASE / BILHARZIOSE
1
2
3
4
5
1. Un Image des vers (schistosome)
2. Un garçon urine avec le sang
3. Une fille tient un verre contenant de l'urine avec du sang
4. Un enfant avec un gros ventre
5. Ces enfants souffrent de la schistosomiase (bilharziose)
6. Ils ont les vers dans le ventre.
7. Les schistosomes vivent dans le ventre, dans la vessie (poche urinaire) et cause les pertes de sang et un affaiblissement de l'organisme.
1. Ils nagent dans les eaux stagnantes
2. Cette maladie provient des schistosomes libérés par les escargots vivant dans l'eau.
3. Les schistosomes pénètrent dans le corps des hommes qui rentrent dans l'eau.
1. Eviter de rentrer/nager dans l'eau stagnante
2. Faire la lessive et la toilette hors des cours d'eau
3. Ne jamais uriner dans un cours d'eau !
4. Quand on urine avec du sang, il faut se faire traiter au dispensaire
gtz-PADESS/ONCHO Sokodé, MS-DRS-RC/Togo/2003

SCHISTOSOMIASE

I – Maladie

Que voyez vous sur ces images ?

- Image des schistosomes (bilharzie)
- un garçon urine avec du sang
- une fille tient un verre contenant de l'urine rouge
- un enfant avec un gros ventre
- des verres avec des urines (normales et anormales)

De quoi souffre t- il / elle ?

Elle/ il souffre de la schistosomiase (bilharziose).
Les schistosomes ou bilharzie vivent dans le ventre, dans la vessie (poche urinaire) et causent les pertes de sang et un affaiblissement de l'organisme, et l'on tombe toujours malade.
La bilharziose vésicale ou schistosomiase est une maladie qui fait uriner avec du sang à la fin de l'urine. C'est une maladie qui a de graves conséquences dans l'avenir sur le malade (cancer de la vessie, stérilité, épilepsie ...)

Avez vous vu quelqu'un souffrir ou qui souffre de cette maladie ?

II - Causes

Pourquoi cette maladie ?

Les enfants qui nagent dans les eaux stagnantes contaminées attrapent la bilharziose.

Comment attrape-t-on ?

Cette maladie provient des schistosomes libérés par les escargots vivants dans l'eau.
Les schistosomes pénètrent dans le corps des hommes qui descendent dans l'eau pour nager, faire les lessives et puiser l'eau.

III – Prévention

Comment éviter cette maladie ?

Pour éviter la bilharziose, il faut :
- éviter de rentrer/nager dans l'eau stagnante,
- faire la lessive et la toilette hors des cours d'eau

Peut-on guérir cette maladie ?

Oui, on peut guérir la bilharziose.
Quand on urine avec du sang, il faut se faire traiter au dispensaire.

Quels moyens utilisez vous pour éviter la bilharziose ?

Pour éviter la bilharziose, il faut :
- filtrer l'eau de boisson avant de la boire,
- ne jamais uriner dans un cours d'eau.

Respectez vous ces moyens ?

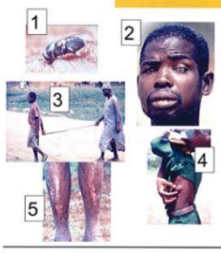
Résumé

La bilharziose est une maladie qui fait uriner avec un écoulement du sang à la fin de l'urine. C'est une maladie qu attaque les deux sexes (homme et femme) . On l'attrape en se baignant dans les marigots, ou dans les marres. Le vers responsable de la bilharziose pénètre la peau lors du séjour dans l'eau (marigot, marre) pour aller habiter dans les parois de la vessi. Quand on urine avec du sang, il faut rapidement aller au dispensaire le plus proche pour se faire soign .Pour éviter cette maladie, il ne faut pas nager dans les eaux des marigots et des marres.

CE QUE JE DOIS RETENIR :

Pour éviter la bilharziose (schistosomiase):
1. Je ne rentre pas dans les eaux stagnantes (eau de marigots, eau de marres...)
2. Je m'adresse aux parents ou á l'infirmier quand j'urine avec du sang
3. Je m'adresse aux parents ou á l'infirmier quand j'ai des maux de ventre ou des vomissements
4. Ne jamais uriner dans un cours d'eau !!!

ONCHOCERCOSE



1. Image d'un moucheron (simulie) en train de piquer
2. Visage d'un aveugle
3. Aveugle tiré par un enfant
4. Enfant avec nodule
5. Grattage de la peau
6. Le nom de cette maladie est l'onchocercose

1. On attrape cette maladie au bord des cours d'eau
2. La maladie est transmise à l'homme par la piqûre d'un moucheron (appelé simulie).

1. Eviter la piqûre du moucheron (simulie)
2. Oui, on peut traiter cette maladie
3. On traite cette maladie en prenant un médicament (comprimés de MECTIZAN)
4. Répéter la prise de comprimés chaque 6 mois
5. Protégez vous bien le corps en travaillant au bord d'un cours d'eau

ONCHOCERCOSE

I – Maladie

Que voyez vous sur ces images ?

- Image d'une simulie (moucheron)
- le visage d'une personne aveugle
- un aveugle tiré par un enfant à l'aide d'un bâton
- les pieds dépigmentés
- un enfant avec une nodule sur la côte.

De quoi souffrent ils ?

Ils souffrent de la perte de la vue (cécité)
Il y a grattage, dépigmentation de la peau.
Cette maladie s'appelle onchocercose. Elle rend aveugle.

II – Causes

Comment attrape- t- on l'onchocercose ?

- on attrape cette maladie beaucoup plus au bord des cours d'eau,
- la maladie est transmise à l'homme par la piqûre d'une petite mouche appelée simulie
- le microbe transmis dans le corps de l'homme se multiplie et détruit petit à petit les yeux de l'homme
- les paysans, les agriculteurs et les pêcheurs qui vivent ou travaillent le long des cours d'eau attrapent facilement l'onchocercose

Quelles sont les manifestations ?

La maladie fait gratter la peau et on devient aveugle à la fin si on n'est pas vite soigné.

III - Prévention

Comment peut on éviter cette maladie ?

Pour éviter cette maladie, il faut :
- éviter les piqûres du moucheron (simulie)
- se protéger très bien le corps quand on travaille au bord d'un cours d'eau.

Peut on guérir cette maladie ?

On guérit très bien l'onchocercose. Il faut prendre régulièrement les produits distribués par les agents de traitement communautaire ou aller au dispensaire pour se faire soigner.

Seule la médecine moderne peut guérir l'onchocercose (hôpital, dispensaire)

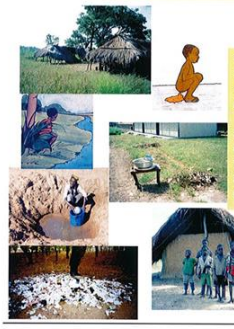
Résumé

L'onchocercose est une maladie de cécité (perte de la vue) causée par un vers transmis à l'homme par la piqûre du moucheron (simulie) . La maladie se manifeste par des grattages de la peau (peau de lézard), par les maux d'yeux entraînant la cécité et la présence des nodules sous la peau.
Pour éviter l'onchocercose, il faut se protéger le corps quand on est au champ pour éviter les piqûres des simulies. Pour tout signe constaté, il faut se rendre au dispensaire le plus proche pour les soins. Le produit (Mectizan) est disponible auprès des agents de santé et gratuit pour tous.

CE QUE JE DOIS RETENIR :

Pour éviter l'onchocercose:
1. Il faut bien se protéger très bien le corps contre la piqûre du moucheron (simulie) quand on travaille au bord d'un cours d'eau.
2. Quand je me gratte souvent la peau avec des maux des yeux ou des nodules sur la peau, je me rends au dispensaire pour les soins.

Hygiène Scolaire



1. L'eau à boire à l'école est sale
2. Les élèves font les selles dans la nature
3. On voit un dépotoir à côté de l'école
4. On voit les déchets derrière les salles de classe et dans la cours de l'école
5. Les élèves vont à l'école sans chaussures
6. Les salles de classes sont en paillotes
7. La salle de classe est sale et désordonnée
8. L'élève va à l'école sale
9. Les élèves n'ont pas de tables bancs

1. A l'école, il y a une fontaine à eau potable
2. Les bâtiments de l'école sont propres
3. L'école a des toilettes et urinoirs
4. Les denrées alimentaires sont exposées sur des tables
5. Les élèves mangent avec des cuillères ou fourchettes
6. Les élèves sont bien habillés et bien chaussés
7. Il y a de l'ombre dans la cour de l'école
8. La cour de l'école est propre
9. Les salles de classe sont bien propres
10. Elève responsable chargé de l'eau
11. Les élèves se font vacciner

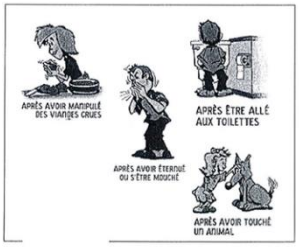
Résumé

L'hygiène scolaire est l'ensemble des règles et pratiques relatives à la conservation de la santé des élèves. Elle a pour but de promouvoir la santé physique, mentale et sociale de la population scolaire. Pour cela, il est nécessaire que le milieu scolaire remplisse certaines conditions de salubrité à savoir un cadre propice, une construction avec aménagement intérieur adéquat, approvisionnement en eau potable et installations sanitaires adéquates.

CE QUE JE DOIS RETENIR :

1. Je me lave toujours les mains au savon avant de manger et après le WC !!!
2. Je vais á l'ecole á l'état propre: le corps bien lavé, le vêtements propres et bien chaussés
3. J'assure la propreté de la classe et de la cour de l'ecole
4. Utiliser toujours les latrines et les urinoires à l'école !!!

Toujours lavez les mains avant aller manger !!! , et aussi ……



VACCINATION

1. Un enfant prend des gouttes de vaccin polio dans la bouche
2. Un enfant paralytique et handicapé et un enfant handicapé marchant à l'aide des bâtons
3. Un enfant souffrant de douleurs
4. La Polio est une maladie grave qui paralyse les membres de l'enfant

>>>> La Polio, Tétanos, la Rougeole, Diphtérie, la Coqueluche et la Tuberculose sont des maladies meurtrières de l'enfance.

> Deux petits sont dans la poussière,
> Deux bras de personnes différentes dont un est vacciné et l'autre non
> Une femme tousse
> Deux couteaux

- Les blessures par des objets tranchants et les plaits souillés causent le tétanos,
- Le contact avec les déchets humains entraîne la Polio
- La tuberculose est une maladie causée par un microbe vivant dans le crachat des personnes malades
- La tuberculose est une maladie qui fait tousser
- La méningite est une maladie qui provient d'un microbe présent dans la poussière

> Un carnet de vaccination
> Un enfant prend des gouttes de vaccin polio dans la bouche
> Un injection

1. Pour éviter les maladies, il faut toujours se vacciner contre: la Polio, le Tétanos, la Rougeole, Diphtérie, la Coqueluche, la Tuberculose
2. Chaque enfant doit avoir son carnet de vaccination bien rempli et bien conservé
3. Chaque enfant doit se faire vacciner contre la méningite chaque 3 ans et la fièvre jaune.
4. Ta vaccination te protège toi même et évite les maladies autour de toi

« Car prévenir vaut mieux que guérir »

VACCINATION

I – Maladie

Que voyez vous sur cette image ?

Nous voyons :
- une injection, c'est une vaccination
- un enfant paralytique et handicapé
- un enfant handicapé marchant à l'aide des bâtons
- un enfant souffrant de douleurs

Ils souffrent de Polio
La polio est une maladie qui paralyse les membres de l'enfant.

La Polio, le Tétanos, la Rougeole, Diphtérie, la Coqueluche et la Tuberculose sont des maladies meurtrières de l'enfance.

II – Causes

- deux petits sont dans la poussière
- deux bras de personnes différentes dont un est vacciné et l'autre non
- une femme tousse
- les blessures par des objets tranchants souillés de poussière causent le tétanos
- le contact avec les déchets humains cause la Polio
- le microbe de la Polio vit toujours dans l'eau et dans les déchets humains
- la Polio est une maladie grave qui paralyse les membres des enfants.
- la tuberculose est une maladie causée par un microbe vivant dans le crachat des personnes malades
- la méningite est une maladie qui provient d'un microbe présent dans la poussière.

Toutes ces maladies sont la cause du manque de vaccination !!!!

III – Prévention

1-Un carnet de vaccination

- Un enfant prend des gouttes de vaccin polio dans la bouche
- Une injection, c'est une vaccination

2- Pour éviter les six maladies meurtrières, l'enfant doit être vacciné contre : la Polio, le tétanos, la tuberculose, la méningite, la rougeole et la Diphtérie avant son premier anniversaire.

3 - Chaque enfant doit avoir son carnet de vaccination être bien rempli et être bien conservé.

4 – Tout enfant doit se faire vacciner contre la méningites chaque 3 ans et contre la fièvre jaune.

Ta vaccination te protège toi-même et évite les maladies autour de toi.

« Prévenir vaut mieux que guérir »

Résumé

La vaccination consiste à introduire dans l'organisme (le corps de l'homme) une substance spécifique appelé vaccin qui détermine une résistance ou conserve l'état d'immunité contre une maladie donnée. C'est un acte médical simple et sans danger . Se vacciner, c'est se protéger. Les enfants ont le droit à la vaccination.
Nous devons réclamer, exiger et contrôler notre carnet de vaccination ceux de nos petites soeurs ou petits frères pour éviter les maladies comme : la Polio, le tétanos, la tuberculose, la méningite, la rougeole et la Diphtérie.

CE QUE JE DOIS RETENIR :

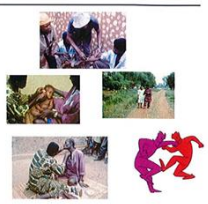
1. Je demande à papa et à maman de me faire vacciner
2. Pour éviter les six maladies meurtrières, l'enfant doit être vacciné contre: la Polio, le tétanos, la tuberculose, la méningite, la rougeole et la Diphtérie avant son premier anniversaire.
3. Chaque enfant doit avoir son carnet de vaccination bien rempli et bien conservé

VIH / SIDA

1. Je vois des malades maigre
2. Je vois une femme qui tousse
3. Ca peut être le SIDA

Le SIDA est une maladie toujours mortelle causée par un microbe (virus) qui se transmet par le sang contaminé et les objets souillés par le sang.

1. Injections à domicile par des personnes non autorisées
2. Faire des cicatrices à un enfant avec des objets non hygiéniques
3. Rasage de tête avec une lame souillée
4. Les enfants utilisent une même lame (objets tranchants)
5. Enfants en querelle se mordant avec les dents
6. Un couple de jeunes gens s'embrasse.



1. Eviter les injections à domicile par des personnes non autorisées
2. Eviter les scarifications
3. Eviter de se faire raser la tête avec une lame commune ou déjà utilisée
4. Eviter d'utiliser les mêmes lames ou tout autre objet tranchant en commune
5. Il est interdit de mordre son prochain avec des dents
6. Etre prudent et ne jamais avoir des rapports sexuels avant le mariage

Pour mieux s'informer sur le SIDA, adressez vous à l'agent de santé le plus proche

gtz-PADESS/ONCHO Sokodé; MS-DRS-RC/Togo/2003

VIH/SIDA

I – Maladie

Que voyez vous sur cette image ?

Il y a :
- un malade maigre
- un enfant fait la diarrhée
- une femme tousse

A quelle maladie pensez vous ?

Il peut s'agir du SIDA

II – Cause

Le VIH/SIDA est une maladie toujours mortelle causée par un microbe (virus, VIH) qui se transmet par le sang contaminé et les objets souillés par le sang.

Que voyez vous sur cette image ?

- Injection avec des objets souillés (seringue)
- on fait des scarifications à un enfant avec des objets non hygiéniques
- Rasage de tête et de barbes avec une lame commune souillée
- Rapports sexuels non protégés.

Tous ces comportements sont des comportements à risque pour attraper le SIDA.

NB : Il est recommandé que la voie de transmission sexuelle ne soit amorcée que dans les classes de Cours Moyen.

III – Prévention

- Eviter les injections avec des objets contaminés
- Eviter les scarifiactions
- Eviter de se faire raser la tête avec une lame commune ou déjà utilisée
- Eviter d'utiliser les mêmes lames ou tout autre objet tranchant en commun
- Il est interdit de mordre son prochain avec des dents
- Etre prudent et ne jamais avoir des rapports sexuels avant le mariage

Pour mieux s'informer sur le SIDA, adressez vous à l'agent de santé le plus proche

Résumé

Le SIDA, Syndrome D'Immuno Déficience Acquise est une maladie de destruction du système de défense de l'organisme causé par un virus appelé Virus de l'Immuno Déficience Humaine (VIH). On l'attrape par voie sanguine, sexuelle et de la mère à l'enfant.
C'est une maladie toujours mortelle.

Tous ces conseils ont pour but de protéger les élèves de l'école primaire et leurs pairs contre les infections au VIH/SIDA.

CE QUE JE DOIS RETENIR :

1. Je dois éviter les injections avec des objets contaminés
2. Je dois éviter les scarifications avec des objets à usage commun
3. Je dois éviter de se faire raser la tête avec une lamme commune ou déja utilisée
4. Je dois éviter d'utiliser les mêmes lames ou tout autre objet tranchant en commun
5. Je ne mords pas mon camarade quand on se querelle
6. Je dois éviter les rapports sexuels avant le mariage pour ne pas attraper le VIH/SIDA

TUBERCULOSE

1. Une personne malade - maigre
2. Une personne malade qui tousse
3. Ca peut être la tuberculose
4. La tuberculose est une maladie mortelle causée par un microbe qui se transmet par la toux, le crachat d'un malade et en vivant avec des malades dans la même maison

> Maison avec des tôles et dépotoires à côté de l'eau
> Deux bras de personnes différentes dont un est vacciné et l'autre non
> deux boefs

1. On attrape la tuberculose quand on rentre en contact avec des malades tuberculeux
2. La vie serrée dans les maisons favorise la tuberculose
3. La vie dans les quartiers sales favorisent la tuberculose
4. La vie en communauté avec les animaux favorise la tuberculose
5. Manque de vaccination BCG favorise la tuberculose

1. Il faut toujours se faire vacciner au BCG pour se protéger contre la tuberculose
2. En cas de toux, il faut aller au dispensaire pour se faire soigner
3. La tuberculose est une maladie qui se guérit par un traitement au dispensaire
4. Le traitement de la tuberculose est toujours gratuit
5. Respecter toujours les règles d'hygiène à la maison (maison balayée, dépotoir organisé, corps et vêtements propres)
6. Enfermer toujours les animaux dans les enclos

gtz-PADESS/ONCHO Sokodé; MS-DRS-RCTogo/2003

TUBERCULOSE

I – Maladie

Que voyez vous sur ces images ?

- Une personne malade - maigre
- Une femme qui tousse (le crachat peut contenir du sang)
- Un enfant malade et maigre

A quelle maladie pensez vous ?

Ça peut être la tuberculose

La tuberculose est une maladie mortelle causée par un microbe qui se transmet par la toux, le crachat d'un malade ou en vivant avec des malades dans la même maison

II - Causes

Que voyez vous sur ces images ?

- maison avec des tôles et dépotoir à côté de l'eau
- deux bras de personnes différentes dont un est vacciné et l'autre non
- deux bœufs

On attrape la tuberculose quand on est en contact avec des malades tuberculeux
- Manque de vaccination BCG favorise la tuberculose
- La vie serrée dans les maisons favorise la tuberculose
- La vie dans les quartiers sales favorise la tuberculose
- La vie en communauté avec les animaux favorise la tuberculose
- La viande de bœuf malade favorise la tuberculose.
- La consommation du lait frais de vache sans avoir l'avoir bouilli favorise la tuberculose

III – Prévention

Qu'est ce qu'il faut faire ?

- Il faut toujours se faire vacciner au BCG pour se protéger contre la tuberculose !!!
- En cas de toux, il faut aller au dispensaire pour se faire soigner
- La tuberculose est une maladie qui se guérit par un traitement au dispensaire
- Le traitement de la tuberculose est toujours gratuit
- Respecter toujours les règles d'hygiène à la maison (maison balayée, dépotoir organisé, corps et vêtements propres)
- Enfermer toujours les animaux dans les enclos
- Eviter de boire le lait de vache non bouilli.

Résumé

La tuberculose est une maladie microbienne contagieuse qui se manifeste toujours par la toux et les crachats accompagnés de sang. Elle attaque toujours plus les poumons. Elle attaque plus vite les personnes non vaccinées.
Pour éviter la tuberculose, il faut avoir fait sa vaccination de BCG et suivre les règles d'hygiène.
Pour tout signe constaté, il faut se rendre au dispensaire le plus proche pour les soins. Le produit est disponible et gratuit pour tous.

CE QUE JE DOIS RETENIR :

1. Il faut toujours se faire vacciner au BCG pour se protéger contre la tuberculose
2. Je m'adresse au parents ou à l'infirmier quand j'ai une toux qui dure plus de deux semaines
3. Enfermer toujours les animaux dans les enclos et éviter de boire du lait de vache non bouilli

REGLES PRATIQUES D'HYGIENE POUR LE CHANGEMENT DE COMPORTEMENT

COURS PRÉPARATOIRES

1. Je dois me protéger pour éviter les piqueres de moustiques
2. Je me lave toujours les mains au savon avant de manger
3. Je lave toujours les fruits avant les manger
4. Je porte toujours les chaussures
5. Je ne rentre pas dans les eaux salles
6. Je demande à papa et à maman de me faire vacciner
7. Je ne joue pas avec des objets tranchants
8. Je ne mords pas mon camarade quand on se querelle

COURS ÉLÉMENTAIRES

1. Pour éviter le paludisme il faut dormir sous une moustiquaire impregnée
2. Pour eviter les vers intestinaux, il faut:
   - toujours se laver les mains au savon avant de manger
   - se laver les mains au savon après le WC
   - porter toujours les chaussures
   - faire toujours le WC dans les latrines
   - laver toujours les fruits avant de manger
   - ne jamais rentre dans l'eau stagnante
3. Je réclame à maman et à papa de me conduire au dispensaire quand je suis malade
4. Je ne joue pas avec des objets pointus et tranchants

REGLES PRATIQUES D'HYGIENE POUR LE CHANGEMENT DE COMPORTEMENT

COURS MOYENS

1. Pour éviter le paludisme je dors sous une moustiquaire imprégnée
2. Je mets la propreté aux alentours de ma maison pour éviter les moustiques
3. Je lave mes mains au savon après le WC et avant de manger, aussi après avoir touché un animal
4. Je vais à lécole à l'etat propre:
   - le corps bien lavé
   - les vêtements propres
   - et bien chaussée
5. Je m'adresse aux parents ou à l'infirmier quand j'ai :
   - des maux de ventre ou des vomissements
   - la fièvre
   - la diarhée
   - des blessures
   - une toux qui dure plus de deux semaines
   - quand j'urine avec du sang
6. Pour éviter le VIH/SIDA, je dois :
   - éviter les rapports sexuels avant le mariage
   - éviter l'utilisation des objets tranchants ou pointus en commun

ANNEX

Dr. CISSE Cayamage, Directeur Régional de la Santé Région Centrale

Mme AOUISSA Tina, Directrice Régionale de l'Education Région Centrale

Dr. TAMEKLOE Tsidji, Directeur Préfectoral de la Santé Tchaoudjo

Dr. GBAGUIGI, Emmanuel, Conseiller Technique Principal, gtz-PADESS

Dr. DOUTI, Kombaté, Assistant Technique, gtz-PADESS

Prof. SCHULZ-KEY Hartwig, Institut Médecine Tropicale, Tübingen, Allemagne

Dr. SOBOSLAY Peter, Coordinateur Laboratoire ONCHO/gtz-PADESS

Mr. BARONA, Timothée, Psychologue Médical, Laboratoire ONCHO/gtz-PADESS

Mr. BLAOUDINA, Toyi Mazamaesso, Assistant d'Hygiène d'Etat, DPS/Tchaoudjo

Mr. TCHADJOBO, Tchassama, Assistant Médical, DRS/RC

Mr. LANTOMEY, K. Oubouènalé, Inspecteur de l'Enseignement 1er Degré Tchaoudjo Sud

Mr. MOTENA, W. Badjibassa, Inspecteur de l'Enseignement 1er Degré Tchaoudjo Sud

Mr. LOUTOU, Tata Yao, Technicien Supérieur Génie Sanitaire, DRS/RC

Mr. PAKOU, Mawa, Technicien Supérieur Génie Sanitaire, DPS/Tchaoudjo