

Assessing the effect of Pests and their co-infections on selected Senior High School Students in the Kumasi Metropolis of Ghana

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ABSTRACT

Pests and insects are disease causing agents when it bites an individual. It is not a rumor that most of the Senior High Schools in Ghana are infested with lots of pest. Apart from their bites they are able to affect food and other items in the schools. The study sought to investigate the impact of pests and co-infection on the Senior High School students in some selected schools in the Kumasi Metropolis. The descriptive study design was employed to study the respondents. An estimated sample size (n) of 227 respondents was arrived at and both the probability sampling and non-probability sampling techniques were employed in attaining the desired sample. Questionnaires were used to collect data from the respondents. The data were collated and analyzed using Statistical Package for Social Sciences (SPSS). Data was analysed using descriptive statistics. The study revealed that students were worried by most insects and rodent such as mouse, rats, mosquitoes, flies bedbug and cockroaches. It was also realized that the habitat for most of these insects and pest were the dormitories. The study however recommends that school administrator adopt more proactive measures to prevent the spread of insects and pests and this could be done by concentrating on preventive measures like fixing windows or louvers, window nets and doors, spraying frequently.

Keywords: pests, insects, co-infection, dormitories, Kumasi Metropolis

1. INTRODUCTION

Pests comprise some of the most life-threatening parasites infecting human and livestock. Alternative meanings include organisms that cause nuisance and epidemic disease associated with high mortality (specifically plague). In its broadest sense, a pest is a competitor of humanity. A pest is any living thing, a plant, an animal or microorganism that has a negative effect on humans. It can be an unwanted plant (weed), fungi, nematode, microbe (such as bacteria or virus), insect, (such as spider, mosquito, cockroach, termites bedbugs, ant etc.), rodent (such as mice, rats, foxes, feral and feral dogs, bat etc.) and birds (such as pigeons, seagulls etc.) (Bennet,1997)

In generic word pests are unwanted or undesirable because they: reduce the availability, quality, or value of human resources such as food, feed, water, or space; injure humans, animals crops structures, and possessions; and spread or cause disease, or interfere with human activities by causing annoyance, discomfort, or inconvenience. Many organisms may become pests whilst certain organisms are often pests but none are naturally pests because irrespective of the damage they cause, all organisms serve a useful purpose in the ecosystem. Most pest can be classified as vectors thereby transmitting diseases from one organism to another (of agriculture or human) disease vector, vermin, weeds and plant pathogens. In the past, the term might have been used for detrimental animals only, thus for example, causing confusion where the generic term 'pesticide' meant 'insecticide' to some people. Also pest may be used to refer specifically to

Pests often occur in high densities, making the damage they do even more detrimental. Animals are derided as pests as they cause damage to agriculture by feeding on crops or parasitizing livestock, such as codling moth on apples or boll weevil on cotton. An animal could also be a pest when it causes damage to wild ecosystem or carries germs within human habitats. Examples of these include that organism which vector human disease, such as rats and fleas which carry the epidemic disease,

mosquitoes which vector malaria and ticks which carry Lyme disease. Pesticides are chemicals and other agents (e.g. beneficial micro – organisms) that are used to control or protect other organisms from pests. The related term insects has much overlap with pest, but generally only includes those creatures that are seen to be vectors of diseases (Bennet, 1997).

Pest can also be beneficial organisms irrespective of the damage they cause to life, the concepts of “beneficial” and “pests” are strictly human defined. All organisms serve a useful purpose in the ecosystem, and are therefore, by default beneficial. As the term is applied here, however it means any living thing that benefits the environment around us (humans), including insects, rodent and birds such as spiders, mites, nematodes, reptiles, mammals, plants bacteria, fungi and viruses. The benefits they provide include pest management, pollination, and maintenance of soil health. It is possible for an animal to be a pest in one setting but beneficial or domesticated in another, for an example, European rabbit introduced to Australia caused ecological damage beyond the scale they inflicted in their natural habitat. Many weeds that is plant pests are also

seen as useful under certain conditions, for instance Patterson’s curse is often valued as food for honeybees and as a wildflower, even though it can be poisonous in livestock, again honey bees are usually thought of as beneficial they pollinate crops and produce honey; however if a swarm takes up residence in your home and get stung, you are more likely to define them as pests. Even plants - feeding organisms may be considered beneficial if they are feeding on unwanted plants like purple loosestrife but if those same bugs start devouring your favourite petunias you may not think of them as beneficial (Boulager, Arlian, Morgan & Neal, 2010).

Pests have different habitat, infestation has serious implication on their victims. The magnitude of them is food facilities areas which are attacked by rodents and some insects. That of place to stay is troubled by some insects, some rodents, and termites where wood is most available. Commercial buildings are attracted by birds. The surrounding or the environment is also attracted by some insects and rodent. Pests cause damage to living things. Such as consuming

human food, causing skin irritation and a lot of the m carry pathogenic bacteria such as salmonella, on their bodies or in their intestines (Boulager *et al.*, 2010). It has been scientifically proved that pests cause serious diseases in humans and animals. Of these, the most widely studied species are from the genera plasmodium toxoplasma, cryptosporidium and Eimeria, the etiological agents of malaria, toxoplasmosis, cryptosporidiosis and chicken coccidiosis respectively (Ayi, Mehlhorn, Hansen, & Mencke, 2009). A fundamental characteristic maintained across the phylum apicomplexa is an obligate intracellular lifestyle; once a victim is bitten by a pest the parasites rely on highly developed mechanisms for

survival thus making clearing infections extremely difficult if not impossible. Ultimately, eliminating the ability of these parasites to established persistent infections in humans and animals is central to controlling their pathogenesis. Again they cause skin irritation, carry disease like scabies hepatitis B, hypersensitivity, ecthyma, cellulitis , allergic reaction respiratory problems and anemic.

Pests are parasitic organisms that carry pathogenic diseases. Their bites have been individually reported to cause severe negative consequences in humans especially immune – compromised individuals. Immuno – compromised individuals include people who have suppressed immune system or have a defect in their immune defenses against infection. This group of people includes pregnant women, HIV patients and patients on chemotherapy for various treatments such as cancer or sepsis. Studies have shown that pests singly causes complication such as pregnancy induced hypertension, anaemia in pregnancy, still birth, severe anaemia in new born babies, maternal morbidity spontaneous abortion and larger head size of new born babies. Studies have further shown that pests carry disease causing microorganisms in and on their bodies and can transfer them to food and food – contact surfaces. They also carry an unsanitary collection of bacteria, fungi, helminthes, and viruses. Pests also destroy millions of cedi on food each year by eating it or by contaminating it with their urine and faeces. It is upon this background that the researcher is investigating the effects of pests and their co -infections on Senior High School Students.

2. REVIEW OF LITERATURE

2.1 An Overview on Household Pests

Pest is a competitor of humanity. There are many kinds of pests. Each crop or animal has some. Pests are species that interfere with human activity or cause injury, loss, or irritation to a crop, stored product, animal, or people. These living things that compete with us for food and fiber, or attack us directly, are pests. The living plant or animal a pest depends on for survival is called the host. Organisms such as insects, rodents, nematodes, fungi, weeds, birds, bacteria, viruses, etc., which damage the crops and reduce yield. Pests are injurious to human health and/ or farmers economic efforts (Rafikov & Balthazar, 2005). A pest is also an organism with characteristics that people see as damaging or unwanted, as it harms agriculture through feeding on crops or parasitizing livestock. An animal can also be a pest when it causes damage to a wild ecosystem or carries germs.

The term pest is used to refer specifically to harmful animals but it also relates to all other harmful organisms, including fungi and viruses. It is possible for an animal to be a pest in one setting but beneficial or domesticated in another. Many weeds (plant pests) are also seen as

useful under certain conditions (Wang, Abou El-Nour & Bennett, 2008). There are many kinds of pests. Each structure, crop, or animal have pests. Pests can be put into five main groups; Insects (plus mites, ticks, and spiders), snails and slugs, vertebrates, weeds and plant disease agents. Human civilization has been competing with insects, rodents, diseases, and weeds for survival throughout its history. Historical records of plagues, famine, and pestilence fill volumes of texts. Modern man has, through his technology, created tools to combat these pests.

Pesticides are used every day to help control pests. Pesticides may be classified according to the target pest species, their chemical constitution, and their site of action. When pesticides are classified based on target pest species, Microorganisms, Arachnids, Insects, Molluscs, Nematodes, Rodents, Birds, Plants are found. Microorganisms are further classified into algae, bacteria and fungi. The classification of pesticides based on their chemical nature is rather complex. Modern pesticides are, in general, organic chemicals (compounds with carbon). However, some inorganic compounds are also used as pesticides. The organic pesticides can be subdivided into classes based on their molecular structure. These classes are organochlorines, organophosphates, carbamates, organomercurials, thiocarbamates, acetamides, ureas, etc. Combining the two methods of classification based on target species and chemical nature, a useful classification system is obtained (Pal & Gupta, 1994).

3. METHODOLOGY

3.1 Research Design

Research design is a plan for conducting research which usually includes specification of the elements to be examined and the procedure to be used (Kotzar, Seuring, Muller & Reiner, 2005). Research design helps to seek information and analyse the evidence of research and also helps to answer initial questions as unambiguously as possible. The study adopted descriptive study design. Descriptive research according to Creswell (2010) examines the existence of a situation in its current state. It involves identification of attributes of a particular phenomenon such as solid waste disposal based on an observational basis.

Moreover, a descriptive research provides an accurate depiction or account of the characteristics for example, researchers' behaviour, opinions, abilities, beliefs and knowledge on a variable (Leedy & Ormrod, 2005). It is in this view that the study adopts descriptive design to enable the researcher to have an accurate picture and understanding of the perception of student effects pest have on them.

3.2 Study Area

The Kumasi metropolis forms part of twenty-nine (2) metropolitan, municipals and districts in the Ashanti Region of Ghana. The administrative capital of the municipal is Kumasi. The Kumasi metropolis is located in the transitional forest zone and is about 270 km north of the national capital, Accra. It is between latitude 6.35° – 6.40° and longitude 1.30° – 1.35° , an elevation which ranges between 250 – 300 meters above sea level with an area of about 254 square kilometers. The unique centrality of the city as a traversing point from all parts of the country makes it a special place for many to migrate to. The metropolitan area shares boundaries with Kwabre East District to the north, Atwima District to the west, Ejisu-Juaben Municipal to the east and Bosomtwe to the south.

The population of the metropolis stood at two million, thirty five-five thousand and sixty four people (2,035,064) with a growth rate of 5.47 percent in 2012 (Ghana Statistical Service [GSS], 2010). According to Kendie (1998), low population growth rate of below 1.5 percent of a town results from out-migration of people from that place, he further pointed out that the low population growth rate cannot be attributed to fertility decline. The major economic activity is trading, however it is also a force to reckon with in terms of manufacturing and other service oriented activities. Because of the booming market, health and educational services the metropolis is able to pull lots of people into it.

3.3 Population and Sample Size

The population includes all Senior High Schools in the metropolis. The rationale being that they are the unit of analysis of the study. The 2010 census put the population of the metropolis to be 2,035,064 with males being 972,258 and females 1,062,806. Population according to Ofori and Dampson (2011) refers basically to the universe of units from which the sample of a study is to be selected. The sample size of the study were organised in the following way. This study adopts the Fisher, Laing, Stoeckel and Townsend (1998) formula for determining sample size. The formula is given

as;

Where:

n = the desired sample size (when the population is greater than 10000);

z = the standard normal deviate, usually set at 1.96 which corresponds to 95 percent confidence level;

p = the proportion in the target population estimated to have particular characteristics;
 $q = 1.0 - p$; and

d = degree of accuracy desired, usually set at 0.05.

This thus indicates that, the study assumes a certain proportion for the target respondents and then works it out. Assuming the target population of respondents in the metropolis (p) is 18% which is equivalent to 0.18, with the z statistic being 1.96 and the degree of accuracy set at 95%. The significant value of this research was at 0.05 significant which means that this research expected that the degree at which responses from respondents to research questions are likely to be false is at 5%.

The sample size (n) for the communities was as follows:

An estimated sample size (n) of 227 respondents was arrived at. This is in line with Patal, Doku and Tennkoon (2003) suggestion that a large sufficient sample size is enough to produce results among variables that are different.

3.4 Sampling Procedure

The study employed both the probability sampling and non-probability sampling techniques in attaining the sample. First, the study would use a simple random sampling technique. That is to say a sample frame containing the list of all schools would be written on a sheet of paper and then folded nicely into a box or hat. Four Secondary Schools would be randomly selected in a lottery approach for the study. Babbie (2007) maintained that simple random sampling procedure has the advantage of producing a representative sample of the population. It is also appropriate to use when the population of study is similar in characteristics of interest. The study would moreover use the purposive sampling to target the boarders in the school. The intention is that they are the one who stay most of their time in the school compound; the day-students go to their respective house when they close from school. Purposive sampling allows the researcher to select the units to be observed on the basis of knowledge of the population and its elements in a way that ensures representativeness (Babbie, 2007). Finally the study would use the convenient sampling technique to arrive at the sample size. Convenient sampling is a kind of technique where the researcher selects anyone comes the way of the researcher. It is less expensive and less cumbersome (Creswell, 2010; Leedy & Ormord, 2005).

3.5 Source of Data

Primary data would be the main source of data used. Primary data is the data which the researcher collects directly from the field through various methods like interviews, surveys, questionnaires, telephone and focus groups discussions (Saunders, Lewis & Thornhill, 2007). Primary data is current and it gives a realistic view to the researcher about the topic under consideration. It is also relatively cheap. On the other hand, the major disadvantage of primary data is that some respondents do not return the questionnaires and it also requires lots of time.

3.6 Data Collection Technique and Data Collection Instruments

Data for the study were collected using the questionnaire. According to Babbie (2007), questionnaire is an instrument specifically designed to elicit information useful and appropriate for analysis of a phenomena. It helps the researcher to determine the extent to which respondents hold particular perspective to the phenomena. The questionnaire was the most appropriate instruments for the study because the size of the sample chosen was large enough for any interviews. Questionnaire surveys have been associated with low response rates and other errors such as biases in responses. For this reason the researcher personally administered the questionnaire in order to obtain high response. However, questionnaires offer a wider coverage since the researcher can approach respondents more easily than other methods (Creswell, 2010). Both open and close ended forms of questions were asked. The choice of the instrument was used because of its inherent advantages over other tools such as focus group discussion and observation. The open ended questions in the questionnaire enabled respondents express their views and reservations that were not provided in the closed ended question on the issue under discussion. For the method of collection and in order to improve the response rate the researcher would administer most of the questionnaires personally. Respondents were identified and issued with questionnaires. Those who were able to complete the questionnaire were asked to relax and later submit it.

3.7 Pre-Test

Pre – testing was done to determine whether questions and directions were clear to respondents and whether respondents understood what was required from them. In addition, to ensure validity and reliability, twenty (20) questionnaires were pre – tested in the selected schools in the Kumasi Metro. This enabled the researcher to ascertain possible errors in the instrument and the necessary corrections were made.

3.8 Data Analysis

The data were collated and analyzed using Statistical Package for Service Solution (SPSS). Data was analysed using descriptive statistics. Frequency tables were constructed for the questionnaire items in line with the objectives of the study as an initial step in the analysis. The frequency tables on the demographic variables were constructed as a way of describing the sample population. Cross tabulation were made for some multiple response questionnaire items in an attempt to reduce analysis-output and thereby creating compact results of manageable proportions.

4 RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

Table 1: Background Characteristics of Respondents

Respondents	N	Frequency	Percent (%)
Gender	227		
Male		98	48.8
Female		103	51.2
Age	201		
below 14 years		55	27.4
15 – 17 years		90	44.8
18 – 20 years		7	4.70
Class of respondents	201		
Form 1		61	30.3
Form 2		48	23.9
Form 3		92	45.8

Source: field work, 2015

From table 1 it was seen that females were one hundred and three representing 51.2% of the entire respondents and the males on the other hand were 48.2%. Again on the table, most of the respondents 44.8% were aged between 15 years to 17 years, while 27.4% were aged

below 14 years. Seven respondents representing 4.7% were also found to be aged between 18 years to 20 years. Moreover on table 1, most of the respondents were in form 3. While as 61 respondents representing 30.3% were in form1, only 48 respondents representing 23.9% were in form 2.

Pest and Insects that cause most Problems to Students

Table 2: Common Rodents seen on campus

Rodents	Frequency	Percent (%)
Rats	54	26.9
Mouse	88	43.8
Birds (vulture)	6	3.0
Squirrels	27	13.4
Other	26	12.9
Total	201	100.0

Source: field work, 2015

On table 2 some of the common rodents were mentioned and most respondents (43.6%) recorded that the mouse was the rodent mostly seen on the school campuses. Fifty four respondents representing 26.9% mentioned that rats were also normally seen loitering on the campuses. Again, 13.4% of the respondents said squirrels were mostly seen on the campuses. Moreover, 3% and 12.9% respective indicated that they usually see birds (vulture) and other rodents that were not captured on the questionnaire.

Table 3: Places where Rodents and Insects are found

Areas	Frequency	Percent (%)
Dormitories	88	43.8
Classrooms	27	13.4

Kitchens	53	26.4
School compound	33	16.4
Total	201	100.0

rodents possess health threat to students on campus.

Source: field work, 2015

Respondents on table 4 mention that most 43.8% rodents were found at the dormitories. Fifty three respondents representing 26.4% said that apart from the dormitories, rodents and insects were also found at the kitchens. About 16% of the respondents mentioned that the school compound are not left out, they have a fair share of the rodents. Again 13.4% of the respondents said rodents were found at classrooms.

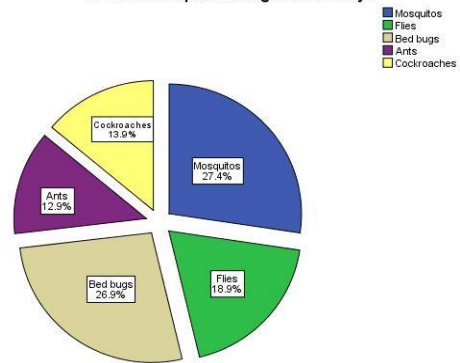
Table 4: Rodent and pest possess threat

Areas	Frequency	Percent (%)
Strongly Agree	134	66.7
Agree	67	33.3
Don't know	0.0	0.0
Disagree	0.0	0.0
Total	201	100.0

Source: field work, 2015

On table 4, respondents were asked whether rodents and insect possess health threat to them, and an overwhelming majority of the respondents 66.7% said they strongly agree that rodents possess threat to them because the presence of pest on the campuses affects academics negatively. Sixty seven respondents representing 33.3% also agreed that rodents on the campuses possess threat to them. This in fact means that all the respondents agreed that

Which insect poses the greatest worry?



Source: field work, 2015

Figure 2: Insect that poses the greatest worry

From figure 2 the study wanted to find out the type of insect that possess the greatest threat or worry to students. It was realised that mosquitos poses the greatest worry to students and this was affirmed by 27.4% of the students. Fifty four respondents representing 26.9% mentioned bedbugs, 18.9% of the respondents indicated that flies were the most worrying insects. Again, while 13.9% of the respondents said cockroaches, 12.9% of the entire respondents mentioned ants as the most worrying insect to student on the campuses.

Discussion of results

Pest and insects that cause most problems to students

The study revealed on table 2 that majority of the respondents recorded that rodents and insects on the campuses exist. The results on the subsequent table indicated that most respondents 43.6% maintained that the mouse was the rodent/household pest mostly seen on

the school campuses. Other continued to mention the rodents like the rats and bird like vultures and crow on the campuses. The respondents again revealed that most of these insect and rodents were seen at the dormitories 43.8%, kitchens 26.4% and the classrooms 13.4%.

Furthermore, more than half of the entire respondents said they strongly agree that insects and rodents possess health threat to them and also 33.3% respondents agreed that household pests were threat as far as health is concerned. Moreover, more than two thirds of the respondents agreed that the presence of pest of the campuses affects academics negatively; just 13.4% said that they do not know whether pests affect their academics negatively. According to the results on figure 3, respondents indicated that mosquitos, flies, bed bugs and cockroaches were the most

worrying insects that affect student's academics and health. The results on figure 3 confirms with the definition of pests by Rafikov and Balthazar (2005) that pests were species that interfere with human activity or cause injury, loss, or irritation to crop, stored product, animal, or people. According to Shuklin (2009) in most developing countries, for which Ghana is no exemption, mosquitos and house flies are the most worrying insects because of their ability to spread the dreadful diseases like malaria and cholera which together are responsible for most deaths in those countries.

Bonner *et al.* (2007); Bradam *et al.* (2005) stressed that people should be worried about cockroaches because they are the type of insects that could be found in any part of the habitable world. Bonner *et al.* (2007) again warned that cockroaches must be controlled because they carry and spread various microorganisms that cause poliomyelitis and cholera. American cockroaches the common ones are able to come into a home from the sewer system making their way through plumbing traps and swimming up into toilets (Wang *et al.*, 2008).

5.2 Conclusions

It can be concluded that pest (insects and rodents) are wreaking havoc or worrying students on the campuses. It was evident from the results that the most worrying pests to students were bed bugs and cockroaches, while the most worrying insect were mosquitos and flies and the most worrying rodents to students were mouse and rats. Dormitories were the place where most of these animals are found.

Recommendations

- The study recommends that the school administrator adopts more proactive measures to prevent the spread of insects and rodent. The schools should concentrate on preventive measures like fixing windows or louvers, window nets and doors.
- Students are also advised to sleep in mosquito net so as to prevent mosquito bites and other stings from the other insects.

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