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INSECTS ASSOCIATED WITH HOSPITAL ENVIRONMENT IN EGYPT WITH SPECIAL REFERENCE TO THE MEDICALLY IMPORTANT SPECIES

By

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Abstract

A study was planned to examine the insect fauna associated with two hospitals: urban (A) in Cairo and rural (B) in Banha, Egypt with varying hygienic levels and their adjacent residential areas (AC) and (BC), respectively and to investigate the effect of hygienic level on species composition and relative abundance. A total of 22 species belonging to 7 orders and 15 families were reported in the four study areas of which, Dipterous flies were the most common (8/22, 36.36% species). A total of 5257 adults were collected of which Dipterous flies were the abundant (3800, 72.28% insect) and *Musca domestica* was the most abundant species (3535, 67.24% insect) which was present in all areas where it was more common / predominant species (21.94%-90.91% insect). Moreover, higher densities of *M. domestica* were in (B) and BC than in (A) or (AC). The heavily infested area was AC (54.55% species) followed by (A), (BC) and (B) however, the total number of the collected insects was higher in (BC) and (B) than in (AC) and (A). This was confirmed by finding maximum diversity indices in (AC) and minimum ones in B. In all areas, means of *M. domestica* was more common during summer/ autumn and spring than in the winter. *Periplaneta americana* collected only during autumn in AC and was more common in autumn in (BC) while *Blatella germanica* collected only during summer in (AC) and was more common in autumn in (B). The prevalence and higher abundance of the medically important species mainly *M. domestica*, *P. americana* and *B. germanica* in rural hospital than in urban one attribute mainly to the lower hygienic level of rural hospital This require a control program based mainly on sanitation supplemented by other measures to overcome the risk of disease transmission by such insects.

Key words: Hospital insects, *M. domestica*, *P. americana, B. germanica*. Biodiversity, Relative abundance, Seasonal abundance, Egypt.

Introduction

Hospitals in general provide ideal and suitable environment for survival and abundance of various medically important insects. Several workers surveyed hospitals for such insects mainly cockroaches and flies. As for cockroaches, generally Zarchi and Vatani (2009) reported that some species live near human and animal habitats and as a result; these insects may be potential mechanical vectors. They have been shown to serve as intermediate hosts for pathogenic helminthes, and to carry eggs of helminthes eggs, viruses, protozoa, and fungi affecting human and other vertebrates. They are also important as allergens agent.

In hospitals and nearby residential areas several workers (Fotedar *et al*, 1991; Pai *et al*, 2003; 2004; Chaichanawongsaroj *et al*, 2004; Elgderi *et al*, 2006; Prado *et al*, 2006; Salehzadeh *et al*, 2007; Saitou *et al*, 2009; Zarchi and Vatani, 2009; Fakoorziba *et al*, 2010; Feizhaddad *et al*, 2012; Jalil *et al*, 2012; Pai, 2013; Menasria *et al*, 2014) collected several *Blatta* and *Periplaneta* *spp*, to isolate and identify microorganisms (Bacteria, fungi and parasites) of medical importance, to ascertain their vector potential in the epidemiology of nosocomial infections and to evaluate the antibiotic resistance of the bacteria isolated from these insects. The role of cockroaches as an allergic agent was confirmed by Schou *et al* (1990) who found antigens in *P. americana* and *B. germanica* which are important as in vivo sensitizing agents and may be used for environmental assays for cockroach exposure in the homes of allergic subjects. El-Gamal *et al.* (1995) indicated that cockroach antigens are common inhalant allergens in Egyptian asthmatic children

As for flies, Sukontason *et al.* (2007) compared the common house fly, *Musca domestica*, and the Oriental latrine fly, *Chrysomya megacephala*, for their potential as carriers of bacteria in urban areas of Chiang Mai Province, northern Thailand. and indicated that *C. megacephala* was significantly more likely to carry bacterial species than *M. domestica*. Bouamama *et al.* (2007; 2010) collected *P. americana* and *M. domestica* from the residential areas of six districts in Tangier, Morocco to isolate and identify some bacteria from their body and reported that although both cockroaches and flies may be vectors of human pathogenic bacteria, the infections caused by them are easily treatable as a result of the high susceptibility of their bacteria to antibiotics routinely used in the community or in hospitals.

Other insects that may have a role in disease transmission within hospitals were reported by Santos *et al* (2009) who surveyed the ant populations (*Pheidole spp, Linepithema humile, Wasmannia auropunctata, Camponotus spp, Odontomachus sp, Solenopsis sp, Acromyrmex sp* and *Tapinoma melenocephalum*) and analyzed the presence of bacteria associated with them in two medium-sized regional hospitals in the municipality of Divinópolis, Minas Gerais, Brazil. These ants mechanically transported *Pseudomonas aeruginosa, Enterococcus, Streptococcus, Escherichia coli* & non-pathogenic and pathogenic *Staphylococcus*. The author indicated that these results show the propensity for occurrences of hospital infections at these sites caused by mechanical transmission of pathogens by ants.

In Egypt, only two available reports on surveying of insects in hospital and their role in disease transmission. Rady *et al.* (1992) surveyed four general hospitals for bacterial contamination of the house fly, *M. domestica* and identified twenty one bacterial isolates belonging to six families; *Enterobacteriaceae, Brucellaceae, Acromobacteriaceae* and *Pseudomonodaceae* Mahmoud *et al.* (2013) conducted a study to investigate the ecological situation, density, infestation rate and control strategy of German cockroach, *B. germanica* indoors in two hospitals in Ismailia Governorate. The author indicated that the population density of *B. germanica* captured from urban hospital was higher than rural hospital and concluded that sanitation, good ventilation has positive impact in reduction of German cockroach infestation.

This study was planned to examine the insect fauna associated with two hospitals (urban & rural) with varying hygienic levels to investigate the effect of hygienic level on species composition, relative abundance and biodiversity. These are important for planning and implementation of control program especially for the medically important insects.

Materials and Methods

Two hospitals with different hygienic levels in Cairo and Banha (the Capital of Al-Qalyoubiya Governorate, 47 km north of Cairo within Delta) and their adjacent (control) areas were selected for this study (Fig. 1), these are: (Ain Shams University Specialized Hospital (A): It is located at Abbassia in the north of Cairo and is considered one of the major hospitals in Cairo, and consists of four main large buildings with 1000 beds, 15 operation rooms, two Intensive Care Units (ICUs) with about 40 beds and one chest ICU with 5 beds. Also, the hospital has one of the 10 centers of liver transplantation in Egypt. The hospital is characterized by its high hygienic level (2) Ain Shams University Specialized Hospital Control Area (AC): A highly populated sector located about 4 km from the hospital (Manshayet Al-Sadr), (3) Banha University Hospital (B): is the major hospital in Banha City. It consists of one building of eight floors with 1000 beds, 18 operation rooms and 18 ICU beds. The hospital is characterized by its low hygienic level due to the presence of an incinerator and garbage around it, and (4) Banha University Hospital Control Area (BC): Is the major vegetable market and surrounding premises located about 5 km from the hospital.

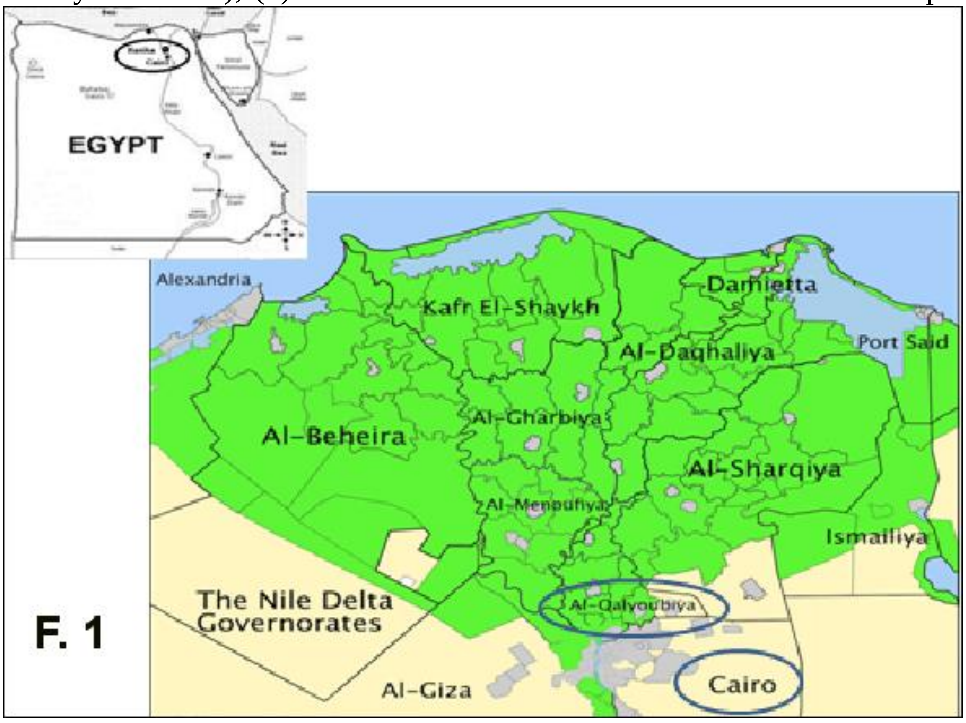

Fig. 1: Map of Egypt showing location of the study areas

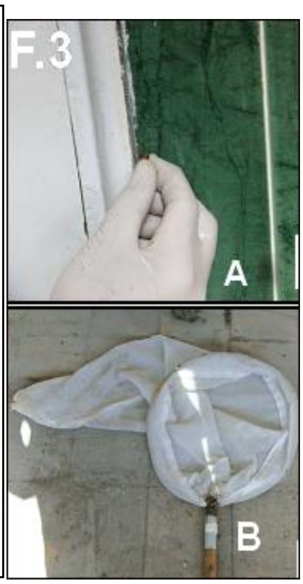

Fig. 2: Collection sites in Banha University Hospital: A. restaurant, B. basement floor and C. office in ophthalmology department and D a garden outside buildings of Ain Shams University Specialized Hospital
Fig. 3: Collection methods of insects: A. Hand catches of crawling insects, B. Net collection for flies

The two hospitals and their control areas were entomologically sampled seasonally from May 2010 to January 2012. Sampling (Fig. 2) was carried out from the gardens and around the buildings of hospital (A) as its different departments was very clean due to carrying out a weekly insect control program. In hospital (B), sampling was carried out from kitchen, cafeteria, restaurant, basement and different departments (ophthalmology, liver and dermatology). From the two control areas, insects were randomly collected from different houses and streets and septic tanks.

The hand-catch method (Fig. 3) was used for collection of such crawling insects using sterile gloves, light weight forceps and vials. Collection of roaches was from the septic tanks in the streets, corners and under tables from the hospital (B). Flies and other flying insects: were caught with a standard cone shaped net made from cloth, with a diameter of 35 cm and a 40 cm woody handle (Fig. 3). Collection of the flies was between 10:0 am and 1:00 pm (the activity time). The trapped insects were placed a killing jars then transported to sterile tubes/vials and subsequently taken to the laboratory and stored in at 0^oC till identification. Insects were examined under a low-power microscope and identified using different taxonomic keys (Shaumar and Mohammed 1983; Shaumar *et al*, 1985; 1989)

The study included the following topics: (1) Species composition and relative abundance of the collected insects (2) Distribution of insect's species in the study areas, (3) Comparison of insect densities in the four areas and (4) Species diversity based on the Simpson (1-D) and Shannon (H) indices for the four study areas and (5) seasonal abundance of the house fly and cockroaches.

Statistically, Means (±SD) of the collected data were calculated and compared by the one-way ANOVA. If ANOVA showed significant inequality of the means they were exposed to pairwise comparisons based on Turkey's honestly significant difference (HSD) test. The Shannon indices of the four areas were compared by t-test. Statistical analysis was performed using PAST (Paleontological Statistics, Version 2.08) computerized software (Hammer *et al*, 2001).

Results

A total of 22 species belonging to 7 orders and 15 families were reported in the four areas (Tab. 1): 8 Dipterous spp. (36.36%), 4 Hemipterous *spp* (18.18%), 2 (9.09%) of Blattodea, 5 Hymenopterous *spp* (22.73%), and one species (4.55%) each of Lepidoptera, Orthoptera and Odonata. A total of 5257 adult insects were collected of which, flies of order *Diptera* were the most abundant (3800, 72.28% insect) followed by Hemiptera (1095, 20.83%), Blattodea (329, 6.26%), Hymenoptera (20, 0.38%), Lepidoptera (6,0.11%), Orthoptera (4, 0.08%) and Odonata (3, 0.06%). Of the reported species, *M. domestica* was the most abundant (3535, 67.24% insect) followed by *C. setaceus* (1050, 19.97%); *B. germanica* (252, 4.79%); *L. sericata* (108, 2.05%); *C. sexmaculata* (80, 1.52%) and *P. americana* (77, 1.46%). The other species in descending order of abundance were: *D. apache* (39, 0.74%); *C. megacephala* (25, 0.48%); *M. stabulans* and *Gymnodia sp*. (20, 0.38% each); *V. orientalis* (9, 0.17%); *S. nodosa*, *E. arbustorum* and *E. amseli* (6, 0.11% each); *N. faliator* and *A. melanorhodon* (4, 0.08% each); *D. bicolor*, *E. decipiens*, Camponotus *sp*, *C. bicolor* and *M. calliphya* (3, 0.06% each); and *M. cleonymoides* (1, 0.02%). The number of the reported species varied among the surveyed areas (Tab. 1). The heavily infested area was AC (54.55% of the collected species) followed by A (45.45%), BC (27.27%) and B (13.64%). Moreover, results (Tab. 1) revealed that the total number of the collected insects was higher in BC (1694) and B (1137) than in the comparable areas; AC (1373) and A (1053). Of the reported species, only *M. domestica* was present in the four areas. In all areas, flies were more common & predominant as compared to the other insects: A (21.94%), AC (64.02%), B (77.84%) and BC (90.91%). The diversity for the insects sampled in the four areas was examined (Fig. 4). The results revealed maximum diversity in (AC) with the highest Simpson index (1-D=0.54) and Shannon index (H=1.14, P<0.001). On the other hand, (B) represented the area with the minimum diversity indices (1-D=0.17 and H=0.41, P<0.001). The other two areas (A and C) exhibited medium biodiversity indices (1-D=0.44 and 0.36; =0.86 and 0.62, P< 0.001, respectively

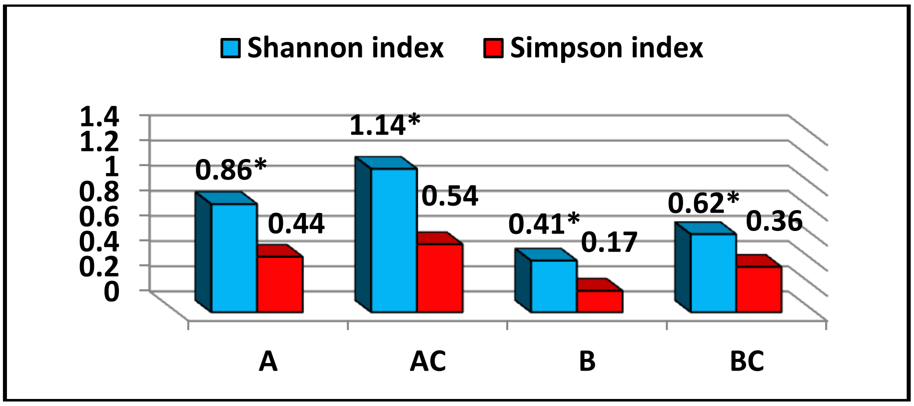

Fig. 4: Indices of species diversity in four areas: * Significantly different from each other (t-test, P< 0.001); A: Ain Shams University Specialized Hospital, AC: Ain Shams University Specialized Hospital control area. B: Banha University Hospital, BC: Banha University Hospital Control Area.

Comparing the cumulative densities estimated for those medically important insects (Tab. 2) revealed that: (1) Although higher densities of *M. domestica* were reported in (B) and (BC) than in (A) or (AC) however, means were insignificantly different (*P*>0.05). (2) Significantly higher density (*P*<0.05) of *P. americana* was reported in (BC) than in (AC) and (3) Significantly higher density (*P*<0.05) of *B. germanica* was reported in (B) than in (AC).

Table 2: Mean densities of house fly and cockroaches in the Ain Shams University Specialized Hospital (A), it's Control Area (AC), Banha University Hospital (B), and it's Control Area (BC).

Species	Mean number[a]				
	A	AC	B	BC	*F (d.f.)*[b]
M. domestica (No/net)	19.25	73.25	80.45	96.25	1.17 (3,11)
P. Americana (No/season)		4.50		14.75	4.10 (1,6)*
B. germanica (No/season)		9.00	54.00		4.54 (1,6)*

a: SD's were omitted, b: *Significant, *P*<0.05

The seasonal abundance of the house fly and cockroaches was investigated (Tab. 3). In all areas, means of *M. domestica* density were significantly different among the 4 seasons (one-way ANOVA: *P*<0.001). Pairwise comparison (Tukey's HSD test) revealed that: (1) In A + AC (rural), flies were absent during winter (16^0C, 42% RH) while were more abundant (*P*<0.01) during summer (38^0C, 23% RH) than in spring (27^oC, 35% RH) and autumn (35^oC, 20% RH), (2) In B+BC (urban), flies were more abundant (*P*<0.001) during summer (36^0C, 40% RH) and autumn (33^oC, 29% RH) than in spring (22^oC, 41% RH) and winter (19^0C, 47% RH) No significant difference (*Q*=1.05, *P*>0.05) between densities during summer and autumn. *P. americana* collected only during autumn in (AC) and was more common in autumn (21 insect) than in the other seasons in (BC) while *B. germanica* collected only during summer in

(AC) and was commonest in autumn (110 insect) than in the other seasons in (B).

Table 3: Seasonal abundance of *Musca domestica* and cockroaches in Ain Shams University Specialized Hospital and its control area (A+AC), Banha University Hospital, and its control area (B+BC)

Season	*Musca domestica* No (Mean, fly per net)[2]		*P. americana*[3] No collected		*B. germanica*[3] No collected	
	A+ AC	B+BC	A+ AC*	B+BC*	A+ AC*	B*+BC
Winter	7 (0)A	4 (35.00) A	0	10	0	25
Spring	6 (70.00) B	8 (62.50)B	0	15	0	45
Summer	6 (85.00)C	8 (110.00)C	0	13	36	36
Autumn	6 (30.00) D	7 (117.50) C	18	21	0	110
F (d.f.)[1]	153.83 (3,21)	158.78 (3,23)				

ł Significant, P<0.001; [2] SD's were omitted; in each column, means with similar letters are not significantly different (*P* >0.05, Tukey's HSD Test); [3] *collect only from these areas;

Discussion

The present study is a report of the results of an entomological survey of insects inhabiting or associated with two hospitals varying in their hygienic level in Cairo (urban) and Banha (rural) and their adjacent residential areas as control ones. The objective of this study was to report and update the species composition, the geographical distribution and seasonal fluctuation of the insect fauna in such areas.

Results indicated that Dipterous flies were the most abundant (8 species, *ca* 72% of the collected insects) and *M. domestica* was predominating (*ca* 67% out of 5257 collected adults) and reported in all areas where it was more common / predominant (*ca* 22-91%) as compared to the other insects. The total number of the collected insects was higher in (BC and B, rural) than in (AC and A, urban) although species diversity revealed maximum diversity in (AC) with the highest Simpson and Shannon indices On the other hand, (B) represented the area with the minimum diversity indices due to its minimum richness (*n* = 3 species). However, no comparable reports either in Egypt or elsewhere are available.

The estimated densities of the most important species revealed insignificantly higher densities (*P*>0.05) of *M domestica* and significantly higher densities (*P*<0.05) of *P. americana* and *B. germanica* in rural (B or BC) than in urban (A or AC) areas. This could be attributed to the low hygienic level of rural hospital (B) as compared with the higher level of urban hospital (A). However, Mahmoud et al (2013) in a study in two hospitals in Ismailia Governorate, Egypt observed that the indoor population density of the German cockroach, *B. germanica* captured from hospital 1 (urban) was higher than hospital 2 (rural) in all months...

The seasonal abundance of the house fly and cockroaches was investigated and indicated that flies were more active (*P*<0.001) during summer (urban area, A+AC) and during summer and autumn (rural area, B+C, *P*<0.001) than in the other seasons. In his study on myiasis of sheep and goats in North Sinai, Amin *et al.* (1997) observed high infestation rate with *M. domestica* was in summer, followed by spring then autumn and the least rate of infestation was in winter. *P. americana* collected only during autumn in (AC) and was more common in autumn in (BC) than in the other seasons while *B. germanica* collected only during summer in (AC) and was more common in autumn in (B) than in the other seasons. Mahmoud *et al.* (2013) results showed that the population density of *B. germanica* in two hospitals in Ismailia Governorate, Egypt increased gradually from January to July, and then decreased gradually till December in both hospitals

Warrell *et al.* (2003) stated that the synanthropic insects which feed or wander over feaces, wounds and food may serve as passive vectors of bacterial and viral diseases. Such insects include pharaoh's ants, *Mon-*

omorium pharaonis, flies, and cockroaches. Despite many reports of the isolation of pathogenic bacteria and viruses from these insects, there have been few epidemiological studies to define their importance as vectors but it is generally accepted that the presence of these insects in hospitals should be monitored and controlled.

Of the reported insect species, *M. domestica, M. stabulans, Gymnodia sp, C. megacephala, L. sericata, S. nodosa, E. arbustorum, P. americana, B. germanica, Camponotus sp, C. bicolor* and *Vespa orientalis* are in a way or another of medical importance.

Cockroaches are among the most notorious and common pests in the environment of public dwellings and many hospitals, especially in houses and institutions with poor standards of hygiene. Due to their nocturnal and filthy habits (feed readily on garbage, sewage, feaces, sputum, skin scrapings and other human detritus as well as varieties of food stuff) in addition to moving freely from areas within and around hospitals that may harbor pathogenic organisms, so they have plentiful opportunity to disseminate human pathogens and are considered ideal carriers for transmitting various pathogenic organisms. Such importance of cockroaches has fully documented by several investigators.

Since the hospital environments provide cockroaches with suitable temperature, humidity and a ready source of food, their presence was not uncommon (Gliniewicz *et al*, 2003) so that they can play a potential role in transmitting bacteria including those with antibiotic resistance as *Klebsiella spp*, fungi and other pathogenic microorganisms in infested areas (Chaichanawongsaroj *et al*, 2004; Pai *et al*, 2005; Elgderi *et al*, 2006; Salehzadeh *et al*, 2007; Bouamama *et al*, 2010). So far numerous pathogenic bacteria, have been isolated from cockroaches. In addition some parasites and fungi have been found in external surfaces or internal parts of body of cockroaches. As cockroach infestation occurs commonly in the hospitals (Pai *et al*, 2003) and although person-to-person contact may be an important nosocomial route of transmission (Pai *et al*, 2004; Fakoorziba *et al*, 2010) they may potentially be implicated as a cause of hospital-acquired infections (Burgess, 1979; Prado *et al*, 2006; Zarchi and Vatani, 2009; Pai, 2013). Besides, cockroaches contaminate food by leaving droppings and bacteria that can cause food poisoning so that their presence can raise safety concerns (Salehzadeh *et al*, 2007; Menasria *et al*, 2014).

The role of cockroaches as allergic agent causing asthma was observed by Schou *et al* (1990) who extracted and purified the allergens (Per a I and Bla g I) respectively from *P. americana* and *B. germanica* and indicated that these allergens may be used for environmental assays for cockroach exposure in the homes of allergic subjects. Moreover, it was reported (Schou *et al*, 1990; Oishi *et al*, 2004; Arruda, 2005) that exposure to cockroach antigens may play an important role in asthma-related health problems. In Egypt, El-Gamal *et al* (1995) assayed cockroach-specific IgE antibodies (CR-IgE) in the sera of 43 out of 51 asthmatic children (84%) and stated that the cockroach antigens are common inhalant allergens in Egyptian asthmatic children. Sherbini and Gneidy (2012) in Al-Fayoum rural area examined *Periplaneta americana*, and 508 house flies *M. domestica* var. *vicina* were collected indoors and outdoors. Flies were abundant in defecation areas and around houses. The recovered zoonotic parasites identified were cysts of *Entamoeba histolytica*, *Cryptosporidium parvum* and *Balantidium coli*, and eggs of *Ascaris lumbricoides, Anchylostoma deodunale, Enterobius vermicularis*, and *Trichuris trichura* as well as larvae of *Strongyloides stercoralis*.

Synanthropic flies are those flies which are ecologically associated with humans and are able to transmit human pathogens mechanically through this close relationship. Over 50 species of synanthropic flies have been reported to be associated with unsanitary conditions and involved in the dissemination of human pathogens in the environment. Numerous members of the synanthropic flies mainly belonging to the family Calliphoridae (*C. megacephala*. and others); are carrion-breeding flies that have forensic importance (Smith, 1986). Some species are myiasis producers (Zumpt, 1965), while others are known vectors of several enteric diseases (Nazni *et al*, 2005; Bouamama *et al*, 2010). In Egypt, Rady *et al* (1992) surveyed four general hospitals for bacterial contamination of *M. domestica* and identified 21 isolates belonging to six families; *Enterobacteriaceae, Brucellaceae, Acromobacteriaceae* and *Pseudomonodaceae.*

The role of *M. domestica vicina, C. albiceps, and L. sericata,* as myiasis producing flies in Egypt was documented by Amin *et al* (1997) in North Sinai, Amin *et al* (1998) in Al Marg District, Khater *et al* (2011) and Morsy *et al* (1991) in Cairo and Giza abattoirs. The rest of the reported species, *M. stabulanus* and other species belonging to the genera, *Gymnodia*, *Sarcophaga* and *Eristalis* are known to cause different forms of myiasis (Zumpt, 1965). mosquitoes, several types of blood-sucking flies, fleas, kissing bugs, lice, and ticks.

Apart from insect-vectors, Saleh *et al*. (2013) examined dust from a military hospital and the private home of some nursing staff. A total of seven species of mites belonging to six genera were recovered. The commonest species was *Dermatophagoides farinae* followed by *D. pteronyssinus* and the lowest *Laelaps nuttalli.* Besides, the 7th mite or *Parasitus consanguineous* live free on dust as a bio-control agent of mites. The presence of mites in and out doors in a hospital and dwellings of medical personnel pave the way to consider HDM as occupational or nosocomial Allergens.

As regarding ants, Santos *et al.* (2009) surveyed ant populations (*Camponotus sp*1 and *sp*2, and others) and analyzed the presence of bacteria associated with them in two hospitals in Braziland, Portugal. They reported that ants mechanically transported several pathogenic bacteria species and that propensity for occurrences of hospital infections caused by mechanical transmission of pathogens by ants. Also, El-Shafie *et al.* (2011) in Egypt reported zonotic dicrocoeliasis by ingestion of ants.

The oriental hornet, *V. orientalis* collected from (A & Ac), a stinging and poisonus insect, causing stings that are more painful to humans than typical wasp stings, however single hornet stings are not in themselves fatal, except sometimes to allergic victims. Barss (1989) reported that multiple stings may be fatal because of highly toxic species-specific components of the venom.

Generally, in the present study, the finding of *M. domestica, L. sericata and B. germanica* with their medical importance in hospital B (rural) and their absence from hospital A (urban) is due to the difference in hygienic status between the two hospitals. The hospital A is characterized by its high hygienic level as hospital departments are very clean due to carrying out a weekly insect control program. In contrast, hospital B is characterized by its low hygienic level due to dirty different facilities and departments in addition to the presence of an incinerator and garbage around it.

On the other hand, in Egypt hospital acquired or nosocomial myiasis was reported. Ghawaby and Morsy (1976) in Ain-Shams University's Hospitals reported human traumatic myiasis caused by *Wohlfahrtia magnifica*. Boulaqi *et al*. (1983) in Cairo University's Hospitals reported aural myiasis in a hospitalized patient. Saleh and el Sibae (1993) reported three cases of nosocomial urino-genital myiasis due to *Piophila casei*. Ahmad *et al.* (2011) in Al-Minia City reported four cases of gastric or intestinal myiasis are reported. The patients were males; a 10 years old child, and 40 years old man) and females; a 18 years old girl, and a 50 years old woman. Three complained of offensive hematemesis of bright red blood, including minute moving worms in the vomitus. The fourth case complained of abdominal distention, nausea, vomiting, and diarrhea. The stool of case 2 was mixed with blood, and minute moving worms were observed in the stool. The recovered larvae were 2nd or 3rd stages of *Sarcophaga* species, and the larvae isolated from case 2 were the third stage larvae of *Sarcophaga* species, as well as 3rd stage larvae of *Oestrus* species. Abosdera and Morsy (2013) in Sohag University Hospitals studied the clinical pictures and pathogenesis of human oral cavity myiasis. They were ten children and the parents of three children. The extracted larvae were *Lucilia sericata* (four cases), *Wohlfahrtia magnifica* (three cases), *Oestrus ovis* (three children and their parents) and *M. domestica vicina* (one case). The presence of *O. ovis* in three children and their parents recommended zoonotic nosocomial myiasis. The predisposing factors were mouth breathing, incompetent lips, low socioeconomic condition, malnutrition, and inability of a child to perform daily activities due to the neurodegenerative disease. Moreover, Morsy (2012) reported that in and outdoors most insect bites cause local inflammatory reactions that subside within a few hours.

However, more severe local symptoms, transmission of a disease-causing pathogen, and systemic allergic reactions are also possible. Mosquito bites can cause varying degrees of local swelling, papular urticaria in children, and rare systemic allergic reactions, including anaphylaxis. Papular urticaria is a hypersensitivity reaction most often seen in children following mosquito and flea bites, although a variety of other bites have been implicated in smaller numbers of reports. Systemic allergic reactions can occur in response to the bites of the insect.

Conclusion

The living conditions and indoor crowded situations of schools, orphanage hospitals and of homeless, refugees, or victims of a natural disaster provide ideal conditions for the spread of many arthropod-vectors of diseases.

Prevalence and higher abundance of the medically important insecs mainly *M. domestica*, *P. americana* and *B. germanica* in rural hospital than in urban one that attribute mainly to the low hygienic level of rural hospital as compared with the high level of urban hospital. This requires draw attention to such situation and efforts should be directed to control such insects.

A control program should be implemented based mainly on sanitation supplemented by other measures; these will have impact on reduction of such insects' infestation to overcome the risk of disease transmission. No doubt, the arthropod-borne diseases continue rapidly to emerge within the deprived population. The Public Health Authorities programs should be engaged to pests control and reduce the incidence of these transmissible diseases, and complications of their injected saliva and/or sting.

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Table 1: Species composition and relative abundance of the collected insects in Ain Shams University Specialized Hospital (A), it's Control Area (AC), Banha University Hospital (B), and it's Control Area (BC).

Order	Family	Species	% collected					
			A	AC	B	BC	Total	
							Order	Species
Diptera	Muscidae	*Musca domestica* Linnaeus	21.94	64.02	77.84	90.91	72.28	67.24
		Muscina stabulans Fallén		1.46				0.38
		Gymnodia sp (Malloch,1926)		1.46				0.38
		Coenosia sexmaculata Meigen		5.83				1.52
	Calliphoridae	*Chrysomia megacephala* (Fabricius)		0.66		0.94		0.48
		Lucilia sericata (Meigen.)			3.17	4.25		2.05
	Sarcophagidae	*Sarcophaga nodosa* Engel	0.57					0.11
	Syrphidae	*Eristalis arbustorum* (Linnaeus)	0.57					0.11
Hemiptera	Cicadidae	*Diceroprocta apache* Davis	3.70				20.83	0.74
		Dorisiana bicolor (Olivier)	0.28					0.06
	Cicadellidae	*Colladonus setaceus* Nielson	71.23	21.85				19.97
		Empoasca decipiens Paoli		0.22				0.06
Blattodea	Blattidae	*Periplaneta americana* (Linnaeus)		1.31		3.48	6.26	1.46
	Blattellidae	*Blattela germanica* Linnaeus		2.62	19.00			4.79
Hymenoptea	Vespidae	*Vespa orientalis* Linnaeus	0.57	0.22			0.38	0.17
	Platygastridae	*Macroteleia cleonymoides* Westwood		0.07				0.02
	Formicidae	*Camponotus sp* (Erichson)	0.28					0.06
		Cataglyphis bicolor Fabricius				0.18		0.06
	Ichneumonidae	*Nototrachys faliator*				0.24		0.08
Lepidoptera	Pterophoridae	*Emmelina amseli* Bigot	0.57				0.11	0.11
Orthoptera	Acrididae	*Anacridium melanorhodon* (F. Walker)		0.29			0.08	0.08
Odonata	Coenagrionidae	*Megalagrion calliphya* (McLachlan)	0.28				0.06	0.06
Total			1053	1373	1137	1694	5257	
No (%) of species (Tot = 22)			10 (45.45)	12 (54.55)	3 (13.64)	6 (27.27)		