



University of Benghazi
Faculty of Science
Department of Zoology

**Incidence of *Blastocystis hominis* infection among
patients and outpatients in two Benghazi Hospitals**

**A thesis submitted in partial fulfillment of the requirement
for the degree of Master of Science.**

By

Lamees Fathalla El- Mestiri

Supervisor

Prof. Dr. Hamed. H . Kassem

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كلية العلوم

قسم علم الحيوان

معدل حدوث الاصابة بطفيل *Blastocystis hominis* بين المرضى
والمتكردين لاثنين من مستشفيات مدينة بنغازي

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﴿ قَالُوا سُبْحٰنَكَ لَا عِلْمَ لَنَا اِلاَّ مَا عَلَّمْتَنَا اِنَّكَ اَنْتَ الْعَلِیْمُ الْحَكِیْمُ ﴾

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DEDICATION

To my beloved father and mother

To my sisters and brother

To my husband, my daughter and son.

To my friends

To all who taught me and are proud of my success

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Introduction

1. Introduction

Blastocystis is unusual enteric protozoan parasite of human and animals. Alexeiff (1911) gave the first accurate description of *Blastocystis* parasite, and named it *B.entrocola* as ,a yeast. Brumpt (1912) coined the name *B.hominis* which remains as it is until now, largely because of the lack of critical research. *B.hominis* is now evidently a protozoan parasite ,inhabitant of large intestine of man (Stenzel and Boreham 1996).

For many years scientists believed that, there is one species of *Blastocystis* that infect humans, while different species of *Blastocystis* infect animals, so they called *Blastocystis* from humans as *B. hominis* and they gave different species names to *Blastocystis* from animals, for example *B. ratti* from rats. *Blastocystis* has presented a challenge to medical and scientific community due to the diversity of its hosts (Udkow and Markell ,1993).

The morphology of *Blastocystis* have consistely noted several major forms (vacuolar, granular and ameboid) and a number of less common forms of organism. *B.hominis* is the causal agent of human *blastocystosis*. It is a polymorphic protozoan found commonly in intestinal tract of human with a growing prevalence in different regions of the world . Its pathogenicity is controversial, however, molecular biological studies showed the presence of at least two morphologically identical populations of *B.hominis* with a different pathogenic capability (;Koustavils *et al.*, 2001). *B.hominis* previously was considered as commensal factor (Boreham *et al.*, 1992) ,but now it is being reported as a potential pathogenic and a causative agent of zoonotic infection (Qadri *et al.*,1989).

American Health Organization recognizes *B.hominis* as an intestinal parasite that causes diarrhea and gastrointestinal manifestations (abdominal pain, vomit, flatulence, excess of gases, anorexia, weight loss and dehydration). Many people have no symptoms, and it is unknown whether *B. hominis* is a primary cause of symptoms. However the presence of organism in stool samples does not mean it causes symptoms and it is often found along with other parasitic organisms, bacteria or viruses that are more likely causes the symptoms . Its pathogenicity was associated with immune suppression, poor nutrition or concurrent infection, personal history of parasitosis. The infection by *B.hominis* increase where sanitation and personal hygiene are inadequate (Garavelli et al .,1989; Lakhanpal *et al* .,1991).

Aim of work: To investigate incidence of *Blastocystis hominis* infection among inpatients and outpatients in two Benghazi hospitals according to sex, age groups , nationalities and localities.

Literature Review

2. LITERATURE REVIEW

Most publications classified *Blastocystis* as a yeast , which belong to different yeast genera such as *Schizosaccharomyces* and *Soccharomyes* .In 1938 , Ciferri and Redaeli put it in the genus *prototheca* with Achlorophylic algae . *Blastocystis* was described as protozoa for the first time by Zierdt *et al* . (1967) ,according to various characters allied the *Blastocystis* with the protozoa *B.hominis* is a pathogenic protozoa parasite that lives in the human bowel and causes diarrhea, it is the causal agent of blastocystosis ,with a growing prevalence in different regions of the world (Stenzel and Boreham 1996).

Classification :

kingdom :Protista

Subkingdom : Protozoa

Phylum : Sacomastigophora

Sub-phylum:Sarcodina

Super-class: Rhizopoda

Class : Lobosa

Sub-class:Gymnamoeba

Order : Amoebida

Sub-order : Blastocystina

Genus : *Blastocystis*

Species: *Blastocystis hominis*

(Levine *et al.*, 1980)

History:

Alexeieff, 1911 and Brumpt, 1912, gave the first accurate description of *Blastocystis* parasite, which remains so today, largely because of the lack of the critical research, the history of *Blastocystis* is dominated by the work of Zierdt (1967) who was credited with bringing this organism to the notice of medical scientists. However, his work has not been subjected to rigorous investigation by other scientists, and contains many inconsistencies. The early scientists who worked on this organism were unable to classify it, and variously they described it as the cyst of flagellate, vegetable material, yeast and fungus.

Zierdt (1967) provided the evidence of assigning *B.hominis* to the subkingdom Protozoa, based on morphology of criteria ultrastructural, it resembles the protists as lack of a cell wall, but contains nuclei, smooth and rough endoplasmic reticulum, golgi complex and mitochondria. Physiologically it is anaerobic sensitive to oxygen, fails to grow on fungal media, grows optimally at 37 C° and neutral PH, and is not killed by antifungal agents.

Morphology:

Reports on the morphology of *B.hominis* have consistently noted several major forms (Vacuolar, granular, cyst and amoeboid forms) (Casemore, 1990) (Plate 1), and a number of less common forms, of the organism. It is currently unknown whether these differences in morphology reflect differences in the biochemistry and general cell

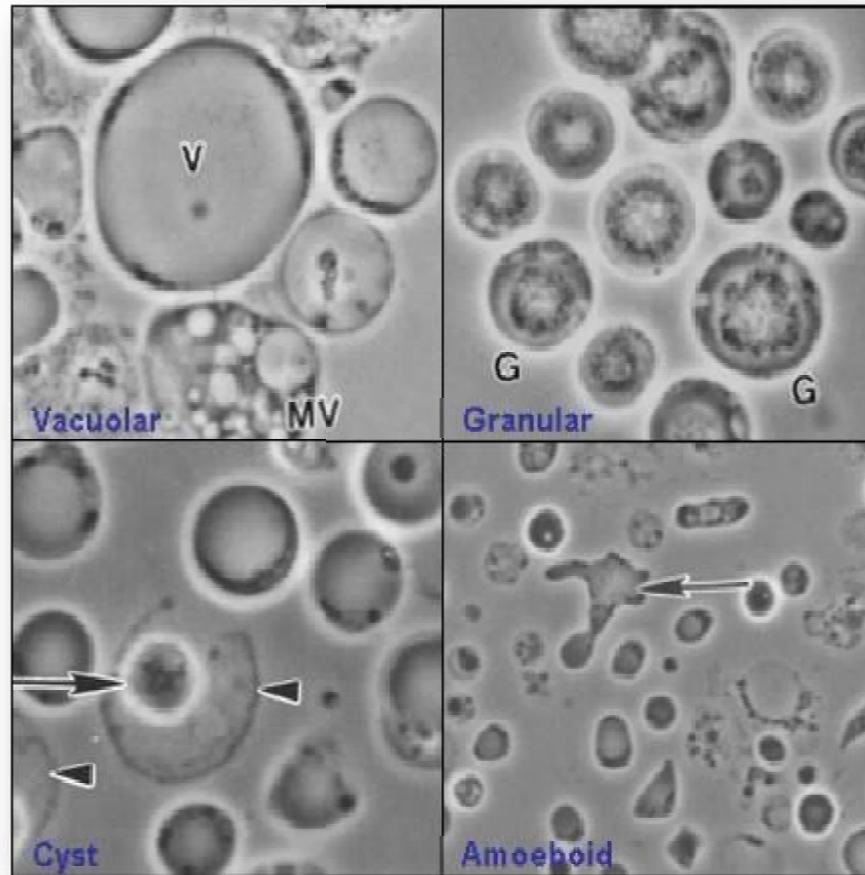


Plate (1) : Morphological types of *Blastocystis hominis*:
(Source : Boreham and Stenzel ,1993).

biology of the organism (Casemore, 1990 and Boreham and Stenzel,1993) . The scientists who worked on morphology are listed below:

The vacuolar form of *B.hominis* was studied by light microscopy. It was found that the *Blastocystis* cell appears as a thin peripheral band of cytoplasm surrounding a large central vacuole. A surface coat of varying thickness, sometimes called cells. Cells vary greatly in size, ranging from $2\mu\text{m}$ to $200\mu\text{m}$ in diameter. (Zierdt 1967 ; Suresh *et al.* , 1995 ; Khalifa 1999)

The granular form of *Blastocystis* was studied by transmission electron microscope and it was reported that the ribosomes are found in the cytoplasm, appears to be of eukaryotic size and short strands are rare. And the ribosomes lining of central vacuole and small vesicles in the cytoplasm, together with rough endoplasmic reticulum surrounding the mitochondria. It was found that the granular form has two types based on light microscope studies. One type was thought to develop into *B.hominis* cells and another located at the cell periphery .(Silard and Burghelea 1985) .It was suggested to have a role in the metabolism. It was reported that the myelin – like inclusion, small vesicles and crystalline granules and lipid droplets were also present in cytoplasm, small vacuoles and vesicles in cytoplasm of granular cells also contained granules of similar appearance to those in central vacuole. (Zierdt 1967 ; Yoshikawa *et al.*, 1988 ; Suresh *et al.* , 1995) .

Some scientists mentioned below described that the cyst like *B.hominis* cells obtained from the fresh feces of patients with acquired immune deficiency syndrome (AID's). and they reported that the cysts-like organism were smaller than typical cultured form, with a thick multilayered fibrillar structure wall and condensed cytoplasm as in other protozoa. Many small vacuoles were present in the cytoplasm rather than the large single vacuoles of cultured organism, and the cyst have been reported to be 5-10 μm in size . (Mehlhorn , 1988 ; Stenzel and Boreham ,1993 ; Zierdt , 1991a)

Stenzel and Boreham (1991) described that the *B.hominis* cell obtained from patient by colon scopy, the cell was rounded to ovoid, approximately 5 μm in diameter, with a plasma membrane, but no surface coat. Small vacuoles and vesicles were noted within the cytoplasm . The nucleus showed a crescentic band of condensed chromatin . (Cassidy *et al .* , 1994) mentioned in their research that the organism present in human fecal material has been shown by transmission electron microscopy to be predominantly multivacuolar rather than containing the single large vacuole seen in cultured cell.The *B.hominis* cysts form a mechanism of survival in the external environment.

The predominance of amoeboid form was found in the stool of symptomatic patients . On the other hand Amoeboid form of *B.hominis* has been rarely reported and it was recovered only in patients with acute diarrhea . These stages were irregular in

shape and had pseudopodia and measured about 2.6-7.8 μ in diameter. (Tan and Suresh , 2007; Lanuza *et al.*, 1997)

The amoeboid form nucleus was not surrounded by double nuclear membrane but was limited by the cytoplasm. A distinct cell wall or membrane was not seen, but dense pockets noted the discrepancies in the description of the amoeboid form and described smaller cells measured about 2.6 – 7.8 *Mm*. (Dunn *et al.*, 1989 ; Stenzel and Boreham ,1993).

Life Cycles :

The life cycle of *B.hominis* has not been completely worked out (Zaman *et al .*, 1995). *B.hominis* inhabits the intestinal tract mainly caecum and colon ,and the two forms vacuolar and granular are commonly found in the caecum and cyst forms are detected in the colon. Both granular and vacuolar forms have developed from ingested cysts (Moe *et al .*, 1997).

The modes of reproduction and the life cycles described in forthcoming reports were extremely varied and often based on very little evidences. It is always possible that some of these reports reflected division of organisms other than *Blastocystis*.

Alexeiff (1911) described a complex life cycle involving binary fission of a binucleate stage (plasmotomic division) and autogamy, asexual phenomenon to form primary cysts, these cysts produced spores by multiple budding ,the spores or

secondary cysts, uninucleate and surrounded by a thick membrane.

Zierdt (1991b) based on his light microscopical observation, he assumed the vacuolar form differentiated into either the granular form which subsequently released vacuolar daughter cells from the central body or amoeboid form which produced prospective vacuolar daughter cells by budding. He proposed that the central vacuole membrane in the schizont was said to be lost and the content seen merge with cytoplasm. He reported that, there are four modes of division, all are asexual: binary fission, plasmotomy and schizogony. Within the host the amoeboid form usually divided by binary fission. It may reproduce by plasmotomy (i.e. one or more progeny from roughly circular extensions of cell). These progeny contain one or more nuclei. Endodyogeny is less common and produces two large progeny with the central body. The viable progeny released by this process were thought to be resistant to air exposure, drying and suboptimal temperatures.

It was proposed by (Suresh *et al.*, 1995) that the life cycle of *B.hominis*. The small avacuolar forms without surface coat are present in the intestine of the host. As they pass through the intestine, the small vesicles present in the cytoplasm coalesce, and the cells appear as multivacuolar forms surrounded by a thick surface coat. The cyst wall appears beneath the surface coat. The result cyst form is to be the infective stage of *B.hominis*. These cysts are able to survive in external environment. If these cysts are ingested by a new host, the excystation occurs exposed to gastric

secretion and intestinal enzymes would complete the life cycle . It is possible that the amoeboid form arises from the avacuolar form because there are some morphological similarities . The vacuolar form has been demonstrated to form after culture of the multivacuolar form . On the other hand the cyst forms have been found in laboratory cultures , indicating that encystation may occur from the vacuolar forms .Finally , culture conditions have been demonstrated to give rise the granular forms.

Zhang *et al* . (2006) found that the amoeboid form of *B. hominis* was irregular in shape with prominent nucleus at central zone and multiple extended pseudopodia at the periphery. Phase contrast microscopy revealed the pinching of cytoplasm from the body of irregular amoebic forms. Ultra structural studies using transmission electron microscopy showed that along irregular mass of cytoplasm was seen to be pinched off from the mother cell with electron dense surface coat surrounding the prospective progenies of *B.hominis*. The body of mother cell with electron dense surface coat surrounding the prospective progenies of *B.hominis*. The body of mother cell showed intense electron dense material these progenies further showed multiple vacuoles and mitochondrion.

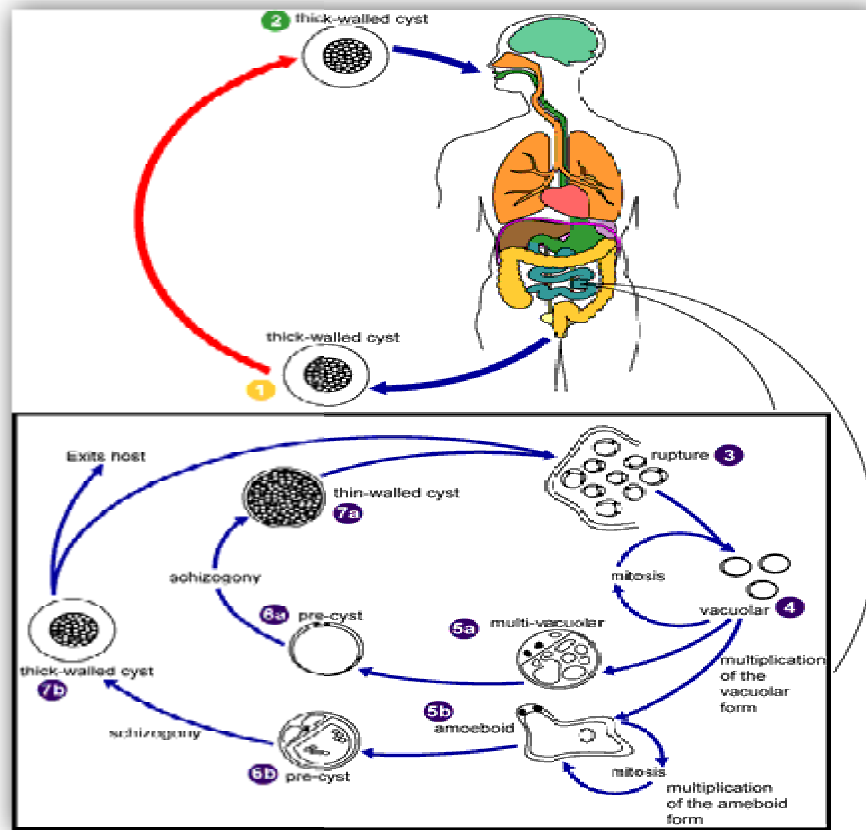


Figure (1): Diagrammatic representation of proposed life cycle of *B.hominis* (Singh *et al.* ,1995).

(1). thick – walled cyst passed in faeces (2). This cyst responsible for external transmission by the fecal – oral rout through ingestion of contaminated water or food (3,4) . The cysts infect the intestinal tract and multiply asexually within the epithelial cells (5a) . Vacuolar form of the parasite give multivacuolar and amoeboid forms (5b) ,(6a) .The multivacuolar develops into a pre – cyst that gives a thin – walled cyst responsible for autoinfection(7a). (6b) The amoeboid form change to a pre – cyst which develops into thick walled –cyst by schizogong.(7b). The thick walled cyst is excreted in faeces.(1).

Diagnosis:

Tan *et al.* (1974) reported that using freezing fracture techniques have extended the result of conventional transmission electron microscopy studies in regard to cell shape distribution of granules in the central vacuole and the presence of membrane-bound organelles. this study confirmed the presence of pores (approximately 50nm in diameter) in the outer membrane and demonstrated that they were not present in the membrane surrounding the central vacuole wall, and though to be a resistant stage.

Van Saunen-Ciurea and El-Achachi (1983) studied the scanning electron micrographs of *B.hominis* from short-term culture. The cells appeared spherical or elongated with a rough surface, and large Peres and indentation were present. No difference was noted between several samples.

Zerdit *et al.* (1983) using conventional transmission electron microscopy, they stated that pores were present on the outer membrane and the central vacuole membrane. Transmission Electron Microscopy has provided much of the evidence of the proteist nature of *B. hominis*. Almost all the new information on the life cycle and cell biology of *Blastocystis* has resulted from the use of TEM. Very few studies have used scanning electron microscopy to investigate the structure of *B.hominis* cells. At present, scanning electron microscopy allows observation of the

three – dimensional structure of *B.hominis*, at a level far beyond the capabilities of light microscopy.

Matsumoto *et al.*(1989) found that endoscopic examination revealed numerous *B.horminis* organism in lumen of ileum and caecum.

Narkewicz *et al.* (1989) reported that a 16-year-old male hemophilia with a acquired immune deficiency syndrome (AID's)-related complex, in whom *B.hominis* was found in duodenal secretion taken by the enterotest (string test), as well as in stools. These reports indicate that *B.hominis* may not always be restricted to the large intestine, as is generally accepted dogma.

Stenzel and Boreham (1991) mentioned that many diagnostic laboratories have taken the vacuolar form of 3 - 5 μ m as standard morphology but in light of recent observations of the form in vivo it essential to look for smaller and multivacoular forms in fresh stools .

Zierdt (1991b) reported that an Immunofluoresence (IFA) stain cause *Blastocystis* cells to glow when viewed under a microscopic, making the diagnostic method more reliable.

Boreham *et al.* (1992) identified *B.hominis* by light microscopy of wet mount of either fresh stool or concentrates staining with iodine or permanent trichrome mounts may did in diagnosis. They mentioned that the appearance some forms of *B.hominis* resemble fat or while blood cells, making it difficult to distinguish the organism from the cells in stool sample, and large number of morphological forms.

Zierdt and Nagy (1993) studies performed by the National Institutes of Health in united states patients suggested that it was possible to distinguish symptomatic and a symptomatic infection with *Blastocystis* using serum antibody testing.

Mahmoud and Saleh (2003) used blood sample, to measure the patient's immune reaction to chemicals present on the surface of *Blastocystis* cell. they found that patients diagnosed with symptomatic *Blastocystis* infection exhibited a much higher immune response than control who had *blastocystis* infection but no symptoms. They indicated that patients symptomatically infected could be distinguishing with a fecal antibody test. The study compared patients diagnosed with symptomatic *Blastocystis* infection to control who had *Blastocystis* infection but no symptoms. In the group with symptoms, IgA antibodies to *Blastocystis* were detected in fecal specimens that were not present in the healthy control group.

Tan and Suresh (2007) reported that the ability to distinguish between disease causing and non disease causing isolates of *Blastocystis* using stool culture and *Blastocystis* cultured from patient who were sick and diagnosed amoeboid forms in culture. These cells were absent in *Blastocystis* from healthy control.

It was reported that genetic analysis of isolated used techniques which allow the DNA of *Blastocystis* to be isolated from fecal specimens. This method has been reported more reliable at detecting *B.hominis* in symptomatic patients than culture. (Yoshikawa *et al.* , 2000 and Parkar *et al.* , 2007)

Pathogenicity and Symptoms :

The most critical question of *Blastocystis* infection today is whether it is a pathogen or a commensal. Recently reported disease in humans caused by *B.hominis* has been called Zierdt- Garavelli disease. Although there are many suggestions that *B.hominis* causes disease. (Boreham and Stenzel , 1993)

The pathogenicity of *B.hominis* has been reported by many workers (Doyle *et al.* , 1990 ; Sheehan and Ulchaker 1990 ; Nimri ,1993 and Nimri and Batchoun , 1994) . *B.hominis* the causative parasite of Zierdt disease is common inhabitant of the human bowel and is now increasingly recognized as a potential cause of diarrhea , and it is assumed that this parasite is transmitted by the fecal –oral route (Zierdt *et al.*,1983 ,Garcia *et al.* , 1984 ; Ricci *et al.* , 1984; Libre *et al.* , 1989 ; Doyl *et al.* , 1990 ; Telabasic *et al.* , 1991 ;

Nimri , 1993 and Gamboa *et al .*, 1998) . On the other hand the pathogenicity of *B.hominis* is a controversial issue , some authors considers it to be pathogen as reported (Libre *et al .*, 1989 and Lee ,1991). Whereas others concluded that it is a harmless (Sun *et al .*, 1989 ; (Boreham and Stenzel ,1993 and Boreham *et al .*, 1992).

Several reports suggested that *B.hominis* was associated with a variety of diseases, including irritable bowl syndrome (Drossman, 1979), Colitis (Russo *et al.*, 1988), diabetes (Scaglione *et al.*, 1990), tropical pulmonary eosinophilia (Enzenauer *et al.*, 1990), ulcerative colitis (Jeddy and Farrington, 1991) leukemia (Garavelli *et al.*, 1991) reactive arthritis (Lakhanpal *et al .*,1991). *B.hominis* the causative of agent Zierdt Garavelli disease in humans (Garavelli *et al.*, 1992).

Zierdt and Tan (1976) described a patient with sever enteric disease discharge copious volumes of diarrheal fluid. They found in that the unusual cells found in diarrheal fluid were the trophozoite of *B.hominis* .

A survey conducted on entero-parasitic infection in children , it was found that the most parasitic elements found was *B.hominis* (Molly ,1993; Mercado and Arias, 1991)

Leelayoova *et al.* (2002) in their studies published in military median of army personal in Thailand they found that infection rate was 44%, infection rates vary geographically and the variant which produces symptoms may be less common in industrialized countries.

Taamasri (2002) in their studies on infected symptomatically with *B.hominis* in Pittsburgh, USA , indicated that 75% of them had a history of drinking well water or travel in less developed countries.

It was studied that the prevalence of *B.hominis* infection in human , in different age groups , sex and seasonal pattern, It was found that the infection with *B.hominis* alone was detected and in combination with other parasites. The most predominate symptoms was abdominal pain ,followed by diarrhea ,constipation , fever and vomiting . (Zaki *et al.* ,1991 Nimri ,1993 ;Haider ,2008).

Epidemiology :

Wenyon (1917) reported that a high rates of *B.hominis* infection in military personal. A nearly account described infection of British troops in Egypt in 1916 who recovered after treatment with emetine.

Kain *et al.* (1987) reported that the median age of persons infected with *B.hominis* was 31 years. and they revealed that *B.hominis* infection was related to the consumption of untreated water.

Qadri *et al.* (1989) conducted a survey on the incidence of *B.hominis*, A stool survey of 515 person showed that on over all infection rate of 72% were aged 13 to 50 years while 19% were over 50 and only 9% under 13 years of age. They discovered that in developing countries generally show *Blastocystis* as being associated with symptoms of *B.hominis* infection.

Kappus *et al.* (1994) study intestinal parasites in the United States, they found that the prevalence rate was 20% and the most common parasite was *B.hominis* (2.6%).

Angel and Fidel (1995) conducted a study on the *B.hominis* infection in Cuban AID's patients, During the period of September 1994 to January 1995, at least two fecal samples were obtained from 67 adult AID's patients , *B.hominis* was identified in 17(25.4%) patients only by direct wet mount with lugols stain. they found that males (14/17) were infected more than females (3/17) , in the majority of cases infected with *B.hominis* alone (12/17) and associated to other intestinal parasite such as *cryptosporidium sp* (2 cases) *G.lambliia* (1 cases), *A.lumbricoids* (2 cases),(1 cases) of infected with each of *E. vermicularis* and *E. histolylica* .

Infection with *B.hominis* among apparently healthy food handlers in Saudi Arabia was studied and it was noted that *B.hominis* was the only parasite found in stoole sample (Amin, 1997 and khalifa *et al.* 2005).

Lee *et al.*(2000) conducted a survey on intestinal parasites among children living in Kaohsiung Country. They found three species of protozoa (*G.lamblia* , *E.coli* and *B.hominis*)were detected. Males and females had the infection rates of 24% and 11% respectively.

Mahdi and Ali (2002) studied the intestinal parasites in Iraqi patients with sickle-cell anemia . They revealed that out of 40 sickle-cell anemia patients 25(62.5%) had parasitic infections .In healthy comparison group 26 out of 175 individuals (14.8%) had intestinal parasitic infections . The most common intestinal isolated parasite in sickle-cell anemia patients was *B.hominis* (36%).

Veronica *et al.* (2003) studied that the prevalence of *B.hominis* among food vendors in markets within the Jurisdiction of Mexico city, the frequency of the intestinal parasitosis reported was estimated and an analysis was carried out associating the presence of *B.hominis* with socioeconomic and hygienic factors. The frequency of intestinal parasites and commensally was 50.4% .*B.hominis* was found in 48 (41.7%) food vendors, the risk analysis showed that *B.hominis* was associated with male gender, poor personal hygiene habits, personal history of parasitosis and family history of parasitosis.

Suresh and Smith (2004) conducted a survey on the prevalence of *Blastocystis* cysts in Scottish and Malaysian sewa. They found *Blastocystis* cysts were detected in 38% (47/123) , 30 scottish, 17 Malaysian workers contained viable cysts. they used vitro cultivation as the gold standard for the detection of *B.hominis* in stool specimens, simple smear and trichrome staining showed sensitive of 16.7% and 40.2% and specificities of 94% and 80.4% respectively.

Graczyk *et al.*(2005) made a study on the association between *B.hominis* and *Endolimax nana* with diarrheal stool of school-age children in Zambia. The overall prevalence of *B.hominis* was 8.6%. The association between infection with *B.hominis* and *E.nana* with diarrhea was statistically significant .Although *B.hominis* and *E.nana* are considered to be nonpathogenic organisms ,this survey supports the evidence that *B.hominis* and *E.nana* infections are associated with deficient sanitation and low hygiene standards which can contribute to diarrhea in children in developing countries.

Nascimento and Moitinho (2005) studied the prevalence of *B.hominis* and other intestinal parasites in a community of ,Parana State , Brazil. The study revealed that 128(70.7%) showed protozoa and/or helminthes in stool samples and infection rate with *B.hominis* was (26.5%) . The high frequency of *B.hominis* demonstrated by this study indicated the need to include laboratory techniques that enable identification of the parasite on routine basis.

Ozcakir *et al.* (2007) studied the characteristic of *B.hominis* infection in a Turkish university hospital. Seven hundred and seventy individuals stool specimens were examined by simple and concentration techniques and stained with iodine solution and stain, among the examined 770 specimens, *B.hominis* was detected in 94 (12.2%). *B.hominis* was the most common intestinal parasite among the study group. It was mostly detected with *Dientamoeba fragilis* infection.

Infection with *B.hominis* had a history of exposure to pets or farm animals (Doyel *et al.*, 1990) suggested that *B.hominis* is zoonotic infection carried via food and water. It was noted that the various studies of *B.hominis* in Libya and elsewhere, showed that the rate of infection in primary school children was higher comparing with the infection in adults, this may due to sensibility of children to contamination than adults (Devera *et al.*, 1998, Guignard *et al.* , 2002 , Iqbal *et al.* , 2001 and El-Ghethmi , 2010).

Familial transmission and transmission within institutes for the mentally retarded (Libanore *et al.*, 1991) have been reported. This would be consistent with fecal-oral transmission. *B.hominis* in thought to be contracted through travel since it has been reported in westerners traveling to the tropic (Doyle *et al.*,1990 ; Sheehan and Ulchaker 1990 ; Shlim *et al.* , 1995). *B.hominis* species are known to occur in many animals (Boreham and Stenzel ,1993) and the close contact between pets and farm animals and human *Blastocystis* has

been reported by several workers (Doyle *et al.* ,1990 ; Scaglione *et al.* ,1990; Rajah *et al.* , 1999 and Noel *et al.* , 2003).

Intestinal Parasites in Libya:

Full information was and still lacking about intestinal parasites in Libya and a few studies were made for diagnosis of *B.hominis*, despite some reports which indicated that the commonest protozoal infections are *B.hominis* (Raof ,2002 ; El-Ammari *et al.* ,2004 ;Al-Fellani *et al.*, 2005 ; Al-Sanousi ,2006 ; El-Gazwi ,2006 ; and Sadaga and Kassem, 2007).

Raof (2002) made stool analysis for the detection of intestinal parasites , she reported that a higher prevalence rate of *Bhominis* 46.15 % among the primary school children in Benghazi,

El-Ammari *et al.* (2004) carried out a study on gastrointestinal parasites among Libyan and non-Libyan resident of Benghazi . The study revealed that 0.24 % of Libyan , 1.43% non-Libyan Arabs and 1.19% non -Arabs were infected with *Bhominis*.

Al-Fllani *et al.* (2005) carried out a prevalence of intestinal parasitic infection in Sebha city among patients attending Central Laboratory , the prevalence of *B. hominis* (18.55%) was observed.

Al-Sanousi (2006) conducted a survey on the prevalence of intestinal parasites among primary school children from Sirt – Libya. A total of 1548 stool specimens were examined by direct

smear and the result showed that 17.5% of children were infected with *B.hominis*.

El-Gazwi (2006) made a comparative studies between three diagnostic methods (direct smear , cocentratin and culture) for *B.hominis* in stool . He was found that culture more sensitive for detection of *B.hominis*.

Sadaga and Kassem. (2007) conducted a survey on the prevalence of intestinal parasites among school children in Derna District Libya. The infection with *B.hominis* was 6.7%.

Materials and Methods

3. MATERIALS AND METHODS

3.1. Place of study:

Benghazi, the second largest city in Libya is situated on the north of great Libyan desert and on the southern coast of the Mediterranean sea. It is occupying an area of approximately 43535 km², with average population 670797 nationals and 47950 non nationals (mostly Arab and African nationalities) .Benghazi has Mediterranean climate with moderate winter and hot summer , the warmest months of the year are July and August where temperature may rise to 35C^o,while the coolest months are January and February where temperature may decline up to 7C^o . Monthly average of rainfall in millimeters is 0.0 to 38.3, the relative humidity range from 50 to 70% throughout the year (Source: General authority for information , Libya ,2008).

3.2. Collection of stool samples :

One thousand five hundred eighty one stool samples were collected from patients and outpatients from two hospitals in Benghazi (Aljamhouria and children hospitals) (Table1) these patients are from different nationalities, age groups and sex. Stool samples were collected in closed and labeled disposable plastic containers during the period from May to August 2008.

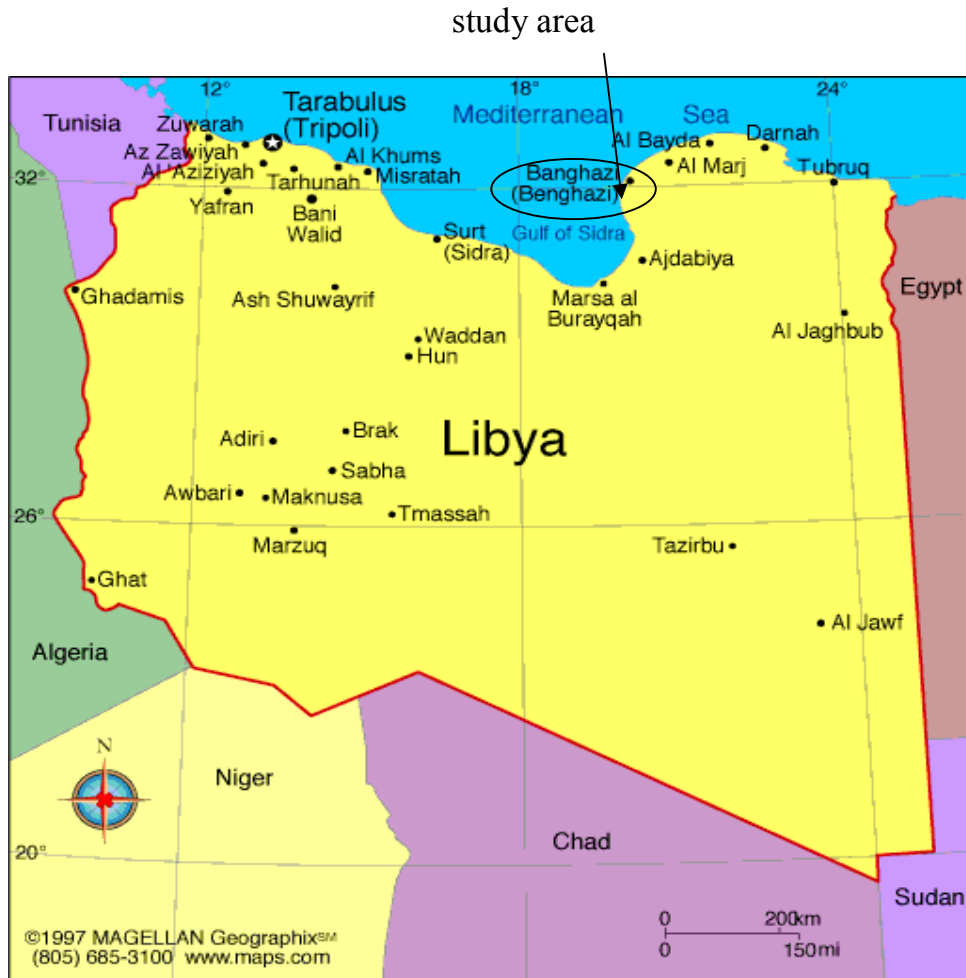


Figure (2):Map of Libya showing area of the study.

**Table (1) :The number of patients and outpatients included
in the study:**

Hospitals	Patients	Outpatients	Total
Al-Jamhouria hospital	87	1272	1359
Children hospital	40	182	222
Total	127	1454	1581

3.3. Questionnaire:

Questionnaire was distributed to patients and outpatients , The questionnaire was prepared to collect information's from each patient included age , sex, locality and nationality . These information's may be associated with the incidence of *B.hominis* infection (Index).

3.4. Parasitological examination:

Fresh stool samples were collected from those patients and outpatients in clean, numbered plastic container with caps. The consistency of stool samples was checked, including five characteristic: formed, semi formed, soft, loose and watery in addition to its colours according to criteria set by the World Health Organization (WHO, 1991). The samples after collection were brought to the laboratory of Zoology Department, faculty of science Garyounis University for further examination.

3.4.1. Direct wet mount smears :

Direct wet mount technique, using unstained in normal saline and stained in Lugol's iodine and eosin preparations smears.

3.4.1.1. Direct saline wet preparation :

The direct saline smear was prepared by mixing a small amount of feces with a drop of normal saline (0.85%). This mixture was covered

by covers lip, then examined using low power (10x) and high power objectives (40x and 100 x) (Neva and Brown ,1994).

4.3.1.2. Direct iodine wet preparation :

This preparation was made by using Lougol's iodine solution (1%) placed on glass slide ,then a small amount of feces was mixed with iodine and covered by glass cover slip , then examined under microscope using low power (10x) and high power (40x and 100x) objectives (Neva and Brown ,1994).

4.3.1.3. Direct eosin wet preparation :

A drop of eosin solution (0.5%) placed on a glass slide . Then by wooden stick small amount of feces was taken and mixed with eosin. A cover slip was put on the mixture and the preparation was examined under light microscope.

3.4.2. Sedimentation method: formalin – Ethyl acetate method .
(Mati, 1995)

Procedure:

- 1- A small amount (5-15gm) of fresh feces was add to a suitable container and mixed well with 10-15ml of formalin using applicator sticks. Allowed them to stand for 30 minutes for fixation.
- 2- Strained the mixture through two layers of dampened surgical gauze into 15ml conical centrifuge tube, and added enough formalin to fill nearly the tube.

3- This suspension was centrifuged at 1500 rpm for 10 minutes. The sediment was re-suspended in formalin and re-centrifuged if the sample contained excessive debris.

4- The washed stool sediment was re-suspended in 7ml of 10% formalin and add 4ml of ethyl acetate. Stopper the tube and shake it vigorously carefully for 30 second, then removed the stopper a way from the faeces as organic vapor might cause spurting of fecal debris.

5- The tube was centrifuged for 10 minutes, at 1500 rmp. Put a small drop of faecal sediment on a one slide then examined by direct method . another drop put on other slide then allow to dry, fix in methanol for 60 second, tip off the methanol, flood the with diluted Giemsa's stain and leave for 20-25 min, run tap water on the slide to float off the stain and to prevent precipitation on smear. Allow it to air dry, and then the entire preparation was examined microscopically in the same way as in the direct wet mount examination.

3.5 Identification and measurements:

The vacuolar, granular and cysts forms of *B.hominis* found in stool sample of patient were identified according to Zeibig (1997). The length and width of *B.hominis* forms were measured with the aid of a calibrated ocular micrometer microscope using appropriate magnification power (x 40 and x 100) .

3.6. Statistical analysis:

The data were subjected to relevant statistical analysis . Chi-squared (X^2) test was carried out after definition of the contingency tables to detect the relationship between the incidence of *B.hominis* and the following parameter : sex , age , nationality, locality and months , X^2 value were tabulated to determine whether or not a significant difference exists between the observed number of cases falling into each category ,and the the expected number of cases ,based on the null hypothesis . A computer program was employ to execute statistical analysis was performed with SPSS for Windows 13.0 .

Results

4. Results

4.1 Incidence:

The study was carried out on one thousand five hundred eighty one patients and outpatients in some Benghazi hospitals. The result revealed that out of the total examined fecal specimens 3.4% (54/1581) was infected with *B.hominis*. The incidence in Al-Jamhouria hospital was higher (3.5%) than that children hospital (2.7%) Table 2 and Fig .3.

The results showed that, three forms of *B.hominis* were detected in examined stool samples. These forms are vacuolar form 81.5% (44/54), granular form 55.6% (30/54) and cyst form 22.2% (12/54). No amoeboid form was detected. The study showed that the mixed infection of the vacuolar and granular forms at incidence rate 29.6% (16/54). The consistency of stool samples was checked, including five characteristic: formed 11.11 % (6 /54), semi formed 42.6 % (23 /54), soft 22.22 (12/54), loose 5.55% (3 /54) and watery 18.51%(10 /54). Out of twenty four patients it was found that 54.16 % (13/24) of them have diarrhea.

Morphology:

(a) Vacuolar form:

The vacuolar form is the typical cell form of *Balstocystis* seen and is often used for the identification of the parasite. These vacuolar form vary greatly in size and measured about 10 μ m, with diameter ranging between (8 m to 14 m). The vacuolar form known as central body form because it has a large central vacuole surrounded by a thin band of peripheral cytoplasm and nucleus (Plate : 2 a and b).

(b) Granular form:

The granular form is somewhat morphologically similar to the vacuolar forms except that distinct granules are observed in the central vacuole , and its diameter ranging between 6.5 – 18 m with an average 13 μ m (Plate : 3).

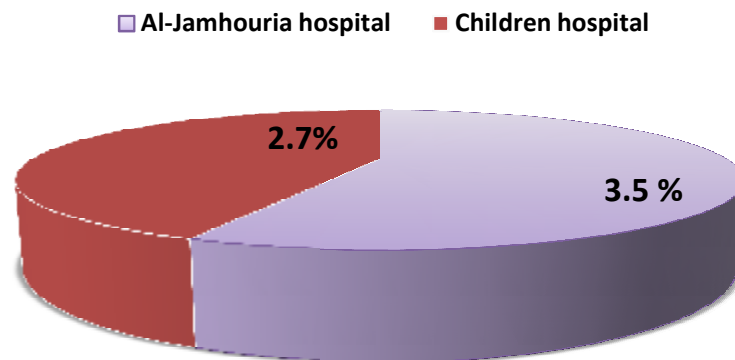
(c) Cyst form:

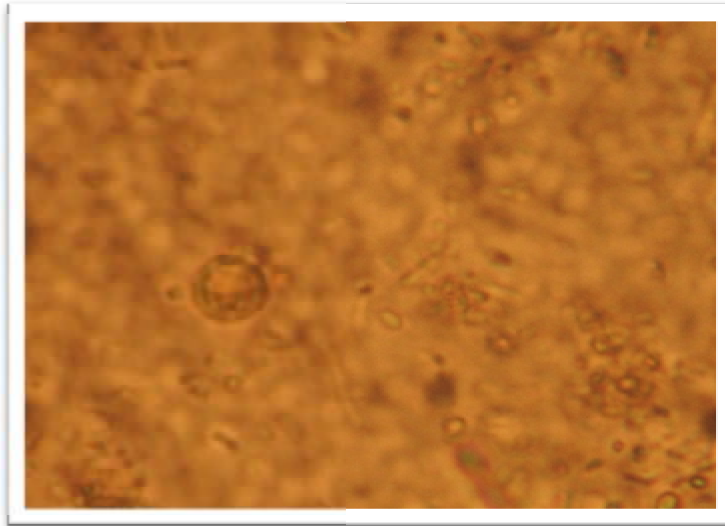
The *Blastocystis* cyst form is, generally smaller in size and has a thick multilayered cyst wall. It lacks a central vacuole and few nuclei, multiple vacuoles and food storage deposits were observed. The cyst form is the most resistant form of this parasite and is able to survive in hard conditions because of thick multilayered cyst wall. The diameter ranging between 3.5 - 7 m with on average 5.5 μ m

Table (2): Overall incidence (%) of *B.hominis* infection in two Benghazi hospitals (N=1581):

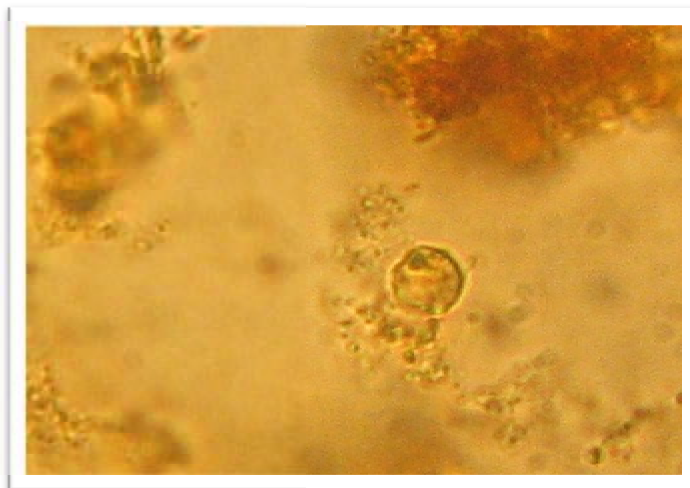
Hospitals	No. examined	% of infected
Al-Jamhoria hospital	1359	3.5 %
Children hospital	222	2.7%

Figure (3): Overall incidence(%) of *B.hominis* infection in in two Benghazi hospitals (N=1581):





(a)



(b)

**Plates (2 a and b): Photomicrograph of vacuolar form
of *Blastocystis hominis* (X 40)**

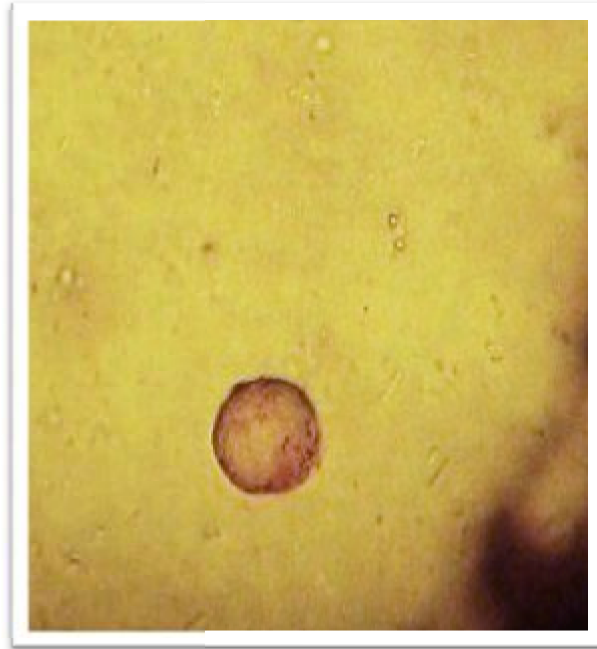


Plate (3): Photomicrograph of granula form
of *Blastocystis hominis* (X 40)

4.2 Incidence of infection and sex

The infection of *B. hominis* in stool samples was detected in both males and females, the relationship between *B. hominis* infection and sex were presented in Table 3 and Fig 4. Among the total infected cases (54), males constitute the majority of infected cases 42 and infected females was 12 when tabulated sex-wise, the incidence was 3.22% for males and 4.2% for females respectively. The incidence between males and females showed insignificant differences between sexes ($p= 0.377$).

4.3 Incidence and age groups:

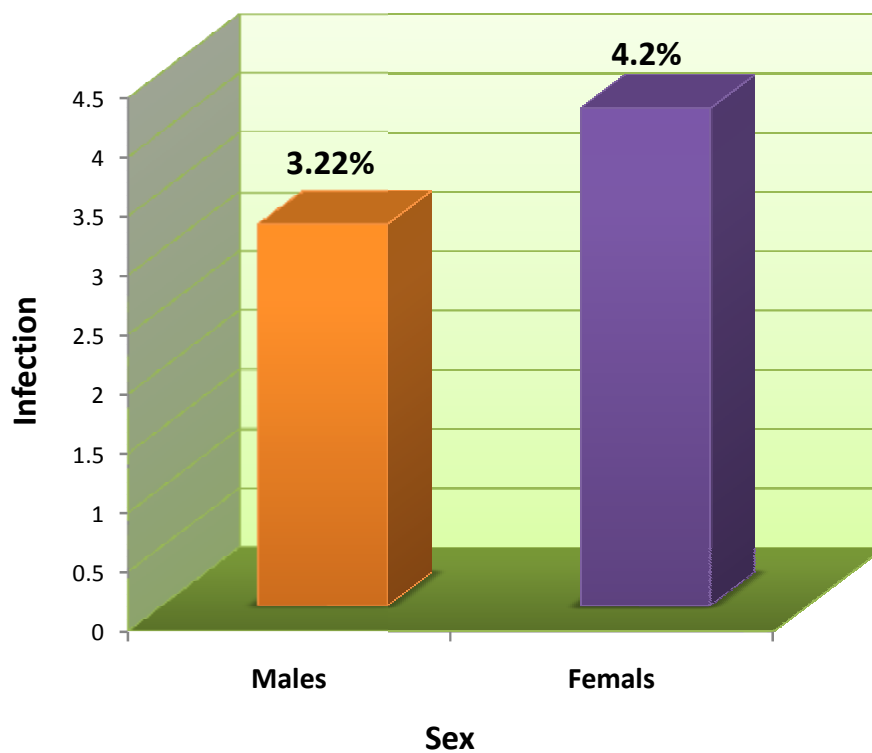
Infection of *B. hominis* was detected in all age groups of 1-10, 10-20, 21-30, 31-40, 41-50 and > 51 years at incidence rates %, The results revealed the highest incidence was detected among age groups 41-50 years old 5.12%, followed by > 51 age group 4.46% while the lowest incidence was among the age group 1 to 10 years 1.9%. Age had insignificant influence on the incidence of *B. hominis* $P = (0.918)$ Table 4 and Fig .5

Table (3) Incidence of *B.hominis* infection according to sex
(N=1581):

Sex	No. examined	% of infected
Males	1301	3.22 %
Females	280	4.2 %

$$\chi^2=0.781 ; \text{d.f} = 1 ; p = 0.377 > 0.05$$

Figure (4) Incidence of *B.hominis* infection according to sex
(N=1581):

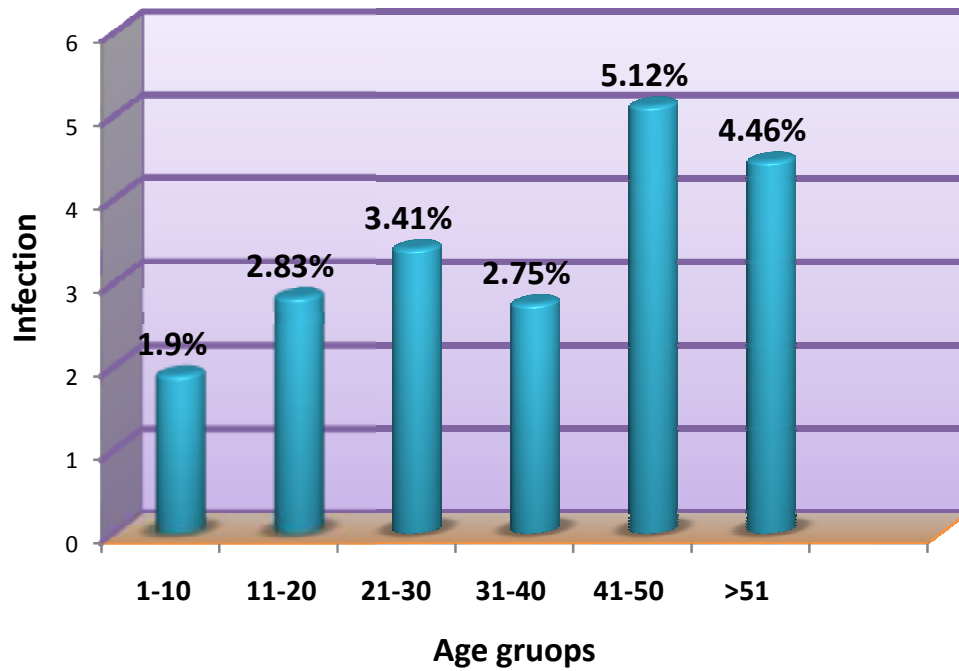


**Table (4) Incidence of *B. hominis* according to age groups (years)
(N=1581) :**

Age groups	No. examined	% of infected
1-10	41	1.9 %
11-20	247	2.83 %
21-30	586	3.41%
31-40	400	2.75%
41-50	195	5.12 %
>51	112	4.46%

$$\chi^2=3.247 ; d.f = 6 ; p = 0.918 > 0.05$$

Figure (5) Incidence of *B. hominis* according to age groups (years)
(N=1581) :



4.4. Incidence and months:

Table 5 and Fig 6 represent the incidence of infection among examined patients and outpatients in some Benghazi hospitals and months of study (May to August). The general , incidence of *B.hominis* was higher in July 4.6 % and minimum incidence in May 1.53 % . There was no significant difference between incidence and months (P = 0.336).

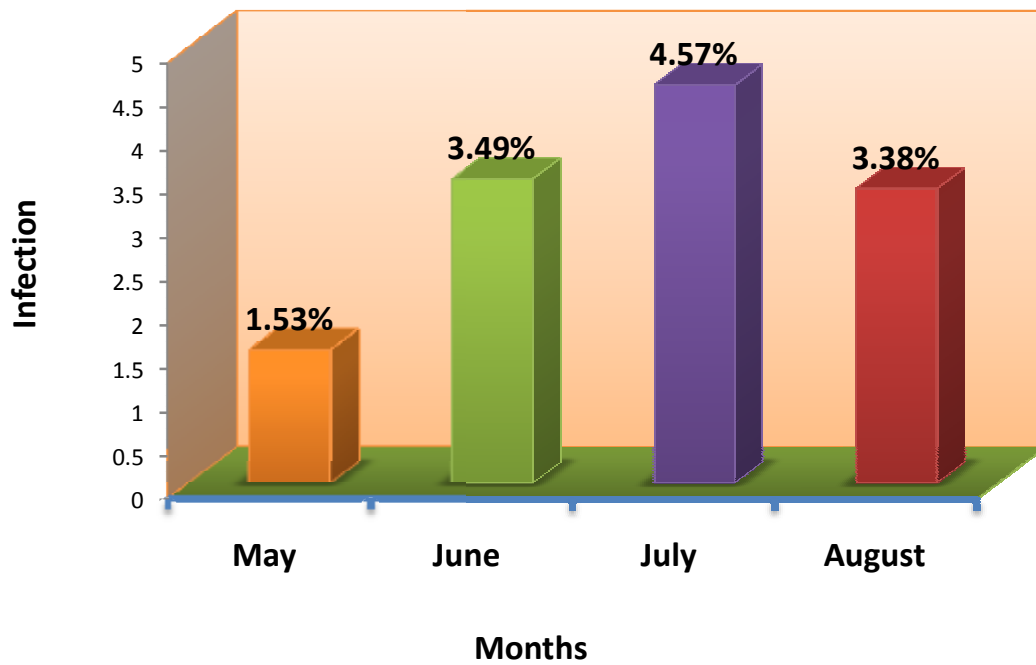
4.5. Incidence of single and mixed infection :

B.hominis was identified in 54 patients and outpatients who represent (3.4%). *B.hominis* was detected in 1.77% , and *B.hominis* with other parasitic species was detected in (*E. nana* , *D.fragilis* ,*G. Lamblia* ,*C. mensili* *E.histolytica* /*E.dispar* ,*E.coli* and *I.butshlii*) at 1.64% represented by Table 6 and Fig 7. Double and triple mixed infection combination were detected represented by Table 7 .

Table (5) Incidence of *B.hominis* according to months (N=1581):

Months	May	June	July	August
No.examined	196	430	350	591
% of Infected	1.53%	3.49%	4.57%	3.38 %

$$X^2=3.389 ; d.f=3 ; p= 0.336 >0.05$$

Figure (6) Incidence of *B.hominis* according to months(N=1581):

(1) Double mixed infection (the combination of *B.hominis* and one parasite only) was found that the incidence highest for *B.hominis* and *Endolimax nana* 12.96% (7/54) followed by *B.hominis* with *D.fragilis* 9.25%(5/54); lowest was for the combine of *B.hominis* with *chilomastix mensili* 1.85%(1/54).

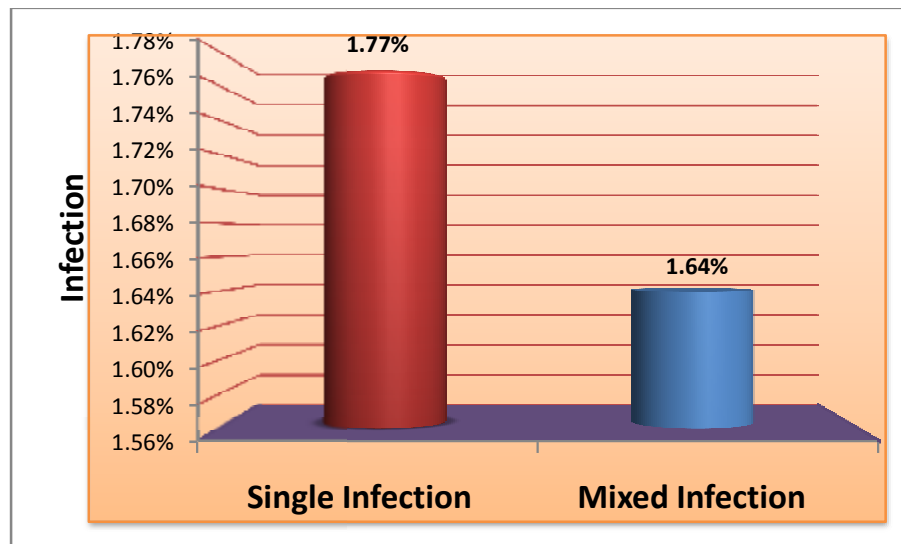
(2) Triple mixed infection (the combination of *B.hominis* with two parasites) the presented table 7 showed that *B.hominis*, had the highest incidence when combined with *E.nana* and *G.Lambliia* at 3.70%. Followed by its combin with *E.histolytica / E.dispar* and *E.coli* at 1.85% and its combin with *I.butschlii* and *E.coli* at 1.85%. The differences in the single and mixed infection of *B.hominis* were statically insignificant $P = (0.529)$.

Table (6) Incidence of single (*B.hominis* alone) and mixed infection of *B.hominis* with other parasites (N=1581):

Types of Infection	No .positive	% of infected
Single Infection	28	1.77%
Mixed Infection	26	1.64%

$$\chi^2 = 0.781; \text{ d.f} = 1 ; \text{ p} = 0.236 > 0.05$$

Figure (7) Incidence of single (*B.hominis* alone) and mixed infection of *B.hominis* with other parasites (N=1581):



**Table (7) : Single (*B.hominis* alone) and mixed infection
(*B.hominis* with other intestinal parasites) :**

Parasites	No. positive	% within infected patients
<i>Blastocystis hominis</i>	28	51.9%
<i>B.hominis</i> + <i>Endolimax nana</i>	7	12.96%
<i>B. hominis</i> + <i>D. fragilis</i>	5	9.25%
<i>B. hominis</i> + <i>Gardia Lambelia</i>	4	7.40%
<i>B. hominis</i> + <i>E. histolytica/ E.dispar</i>	3	5.55%
<i>B. hominis</i> + <i>E. coli</i>	2	3.70%
<i>B. hominis</i> + <i>chilomastix mensili</i>	1	1.85%
<i>B. hominis</i> + <i>Endolimax nana</i> + <i>Gardia lamblia</i>	2	3.70 %
<i>B. hominis</i> + <i>E. histolytica / E.dispar</i> + <i>Ecoli</i>	1	1.85%
<i>B. hominis</i> + <i>I. butschlii</i> + <i>E. coli</i>	1	1.85%

4.6. Incidence and nationalities:

The incidence of *B.hominis* infection in Libyan patients was found to be 3.4% with corresponding 3.42 % for non-Libyan. Differences in infection between Libyan and non Libyan patients were statistically insignificant ($P = 0.903$) (Table 8 and Fig 8).

4.7. Incidence and localities:

Incidence of *B.hominis* infection within the study localities in Benghazi and out Benghazi is shown in Table 9 and Figure 9. The results showed that outBenghazi patients and outpatients displayed the highest parasitic infection when compared with in Benghazi patients and outpatients 4.45% , and 3 % respectively . Differences in incidence of infection and localities were statistically significant ($p= 0.075$).

Table (8): Incidence of *B.hominis* according to nationality (N=1581) :

Nationality	No. examined	% of infected
Libyan	1027	3.40 %
Non-Libyan	554	3.42 %

$$\chi^2 = 0.015 ; d.f = 1 ; p = 0.903 > 0.05$$

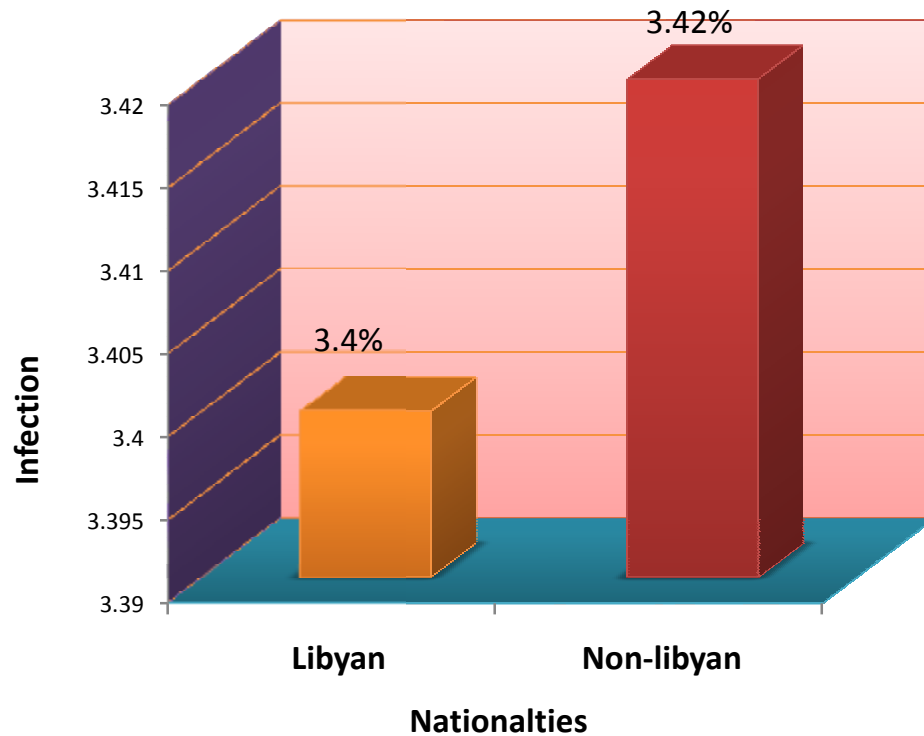
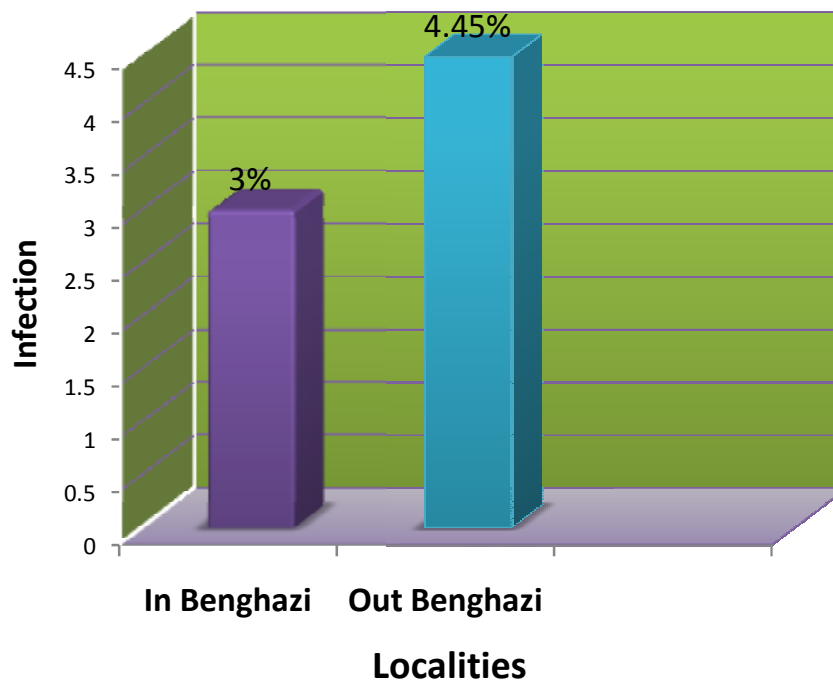
Figur(8): Incidence of *B.hominis* according to nationality(N=1581):

Table (9): Incidence of *B.hominis* according to localities (N=1581):

Localities	No. examined	% of infected
In Benghazi	1132	3.00 %
Out Benghazi	449	4.45 %

$$\chi^2 = 3.363 ; \text{d.f} = 1 ; p = 0.075 < 0.05$$

Figure (9): Incidence of *B.hominis* according to localities (N=1581):

Discussion

5. DISCUSSION

B.hominis is the causal agent of blastocystosis which is an intestinal parasitosis with a various prevalence in different parts of the world. *B.hominis* has been traditionally regarded as a non – pathogenic parasite of humans ,the pathogenic potential of *B.hominis* has been reported in the literature since 1899 (Zierdt, 1991a)and studies reporting it's association with human disease have been increasing (Garcia *et al.*,1984; Lebar *et al .*, 1985 ; Stenzel., *et al* 1989; Kabatereine, *et al.*,1997 and Minviella *et al .*, 2004).

5.1. Incidence :

The overall incidence of *B.hominis* in this study was 3.4%.the same results were reported previously in libya. Almost similar prevalence rates have been described in Libya , El-ammari (2004) in Benghazi reported that prevalence of *B.hominis* revealed that the prevalence of *B.hominis* infection in Libyans was lower (0.24%), while in Africans (1.43%),and in non-Africans was found (1.91%). The data in the present study showed that lower incidence rate of *B.hominis* (3.4%) compared to some previous studies in Libya . Raof (2002) reported that the prevalence of *B.hominis* infection among primary school in Benghazi *B.hominis* was 46.15% .Ibrahem (2003) conducted prevalence and *B.hominis* among children and neonates in Sirt city the prevalence of *B.hominis* was 12.57%. Sadaga and Kassem (2007) reported that the prevalence of *B.hominis* among primary school children in Derna districts, was 6.7%. Al-Sanousi (2006) detected overall prevalence of *B.hominis*

17.9% among primary school children in Sirt city . Moreover , high incidence rates of *B.hominis* has been also reported in Libya from Sabha city , 18.55 (Al-Fellani *et al.*, 2005); 26.6% (Mohammed *et al.* , 2007) ; 18.6% (Saleh ,2007) , from Tripoli at 46.4 % (El-Ghethmi ,2010). Al-Fellani *et al.*, (2005) reported commonest incidence of *B.hominis* among out patients in Sebha city , and they suggested that dry and hot weather of this region favoring the survival and transmission of this parasite in the population of Sebha in Libya, due to rapid socio-economic development and agricultural practices may impact on the transmission of intestinal parasites and public health generally and endemicity of diseases in particular Every year in Libya , a large number of foreign workers , who apparently appear healthy ,and asymptomatic may be the carriers of some intestinal parasites,and may establish a substantial increase of intestinal parasites in the country .

The high incidence rates of *B.hominis* were reported all over the world that , 18 % in Bethesda (Zierdt ,1983) , 12.2% in USA (Garcia *et al.*, 1984), 14.2% in Germany (Hahn and Fleischer, 1985), 22.4% in Austrilia (Walker *et al.*, 1985), 12.7% in Canada (Kain *et al.*, 1987), 17.5% Saudi Arabia (Qadri *et al.*, 1989), 51.8 % Niger(Develous *et al.*, 1998), 31% in Eygpt (El-Masry *et al.* ,1990), 3.2% Canada (Doyle *et al.*, 1990), 45% in chile(Figueroa *et al.*, 1990), 10.3% in Venezuela (Castrillo de Trado *et al.*, 1990), 25% in Jordan (Nimri,1993) , 22.22% in healthy food handlers in Sudi Arabia (Amin, 1997), 39.13% in

Bolivia (Devera *et al.*, 1998), 23% in USA (Amin , 2002), 36% in Iraq (Mahdi and Ali ,2002) , 38% in Kuwaite (Iqbal *et al.* , 2001), 44.44% in homeless children in Argentina (Guingard *et al.*,2002), 25.8% in Venezuela (Requena *et al.* ,2003),52.9% in Texas ,WSA (Escobedo *et al.* , 2003), 40.7% in Philippines (Eleonor *et al.* , 2004) 22.9% in Argentina (Minvielle *et al.* ,2004), 32%in general population in Pakistan (Yakoob *et al.*, 2004), 38% in Malaysia (Suresh and Smith 2004), 53.8% among schoolchildren in Zambia (Graczyk *et al.* , 2005) , 26.5% in Brazil (Nascimento and Moitinho,2005)51.6% inVenezuela (Diaz,2006) .

Several reports suggested that *B.hominis* was associated with a variety of diseases, including irritable bowel syndrome (Drossman, 1979), Colitis (Russo *et al.*, 1988), diabetes (Scaglione *et al.*, 1990), tropical pulmonary eosinophilia (Enzenauer *et al.*, 1990), ulcerative colitis (Jeddy and Farrington, 1991) leukemia (Garavelli *et al.*, 1991) reactive arthritis (Lakhanpal *et al.* ,1991). *B.hominis* the causative of agent Zierdt Garavelli disease in humans (Garavelli *et al.*, 1992).

Several reports have suggested that *B.hominis* may be an opportunistic infection in immunosuppressed patients with AID'S (Henry *et al.*, 1986 ; Narkewicz *et al.*, 1989 and Garavelli *et al.*, 1989).

B.hominis occurs in various morphological forms :cystic stage , vacuolar , granular and amoeboid (Borrham and Stenzel ,1993) ,in the present study all forms of *Blastocystis* were detected except amoeboid

form . Concerning the morphological characters of the parasite , the vacuolar form was the most abundant form seen comparison to two other forms (amoeboid and granular forms). This observation agreed with Suresh and Smith (2004) ;Yaicharoen *et al.*, (2005) and Hokelek (2007) . The vacuolar form of *B.hominis* is the most commonly form found in cultures and this form normally used for the diagnosis of *B.hominis* infection in stool (Garcia and Brukner ,1997).

5.2. Incidence of infection and sex

The incidence of *B.hominis* among males and females reported in this study was 77.8% and 22.2% respectively. No significant difference exists between incidence and sex groups ($p>0.05$) this finding was in agreement with the results reported by Omar *et al.* (1991), El-Ammari *et al.* (2004), El-Ghethmi (2010) and as well from other parts of the world (Guirges and Al-Waili, 1987 and Qadri *et al.*, 1989). *B.hominis* infection among males was slightly higher than females sex ratio (Sun *et al.* ,1989; Doyle *et al.*, 1990; Torress *et al.* , 1992; Raof ., 2002; Wang *et al.* ,2002; Requena *et al.* ,2003 ; Eleonor *et al.* , 2004 , Leder *et al.* , 2005 ; Sadaga and Kassem 2007 and El-Ghethmi , 2010). The prevalence of infection among males was higher than females because the males have fewer restrictions than females and the males have leisure are strictly controlled (Akogun and Badaki, 1998 and Magambo *et al.* ,1998) . Significant difference of prevalence between sexes was reported in Sebha city by

Khan *et al.*, (2008). The presence of difference in the prevalence between males and females for this parasite may be the result of comparable susceptibility to infection ,equal exposure to contaminated source of infection as well as the persistence of unhygienic attitudes . Higher infection rate which seen in males appear to be associated with their more activity nature and little hand wash than females .

5.3. Incidence and age groups:

The preset study showed that all age groups were infected. The highly incidence of parasite (37%) was discernible in 21-30 years and the minimum incidence was in young age groups (%1.9) . This suggests that the absence of immunity and implies that children of all ages are susceptible to infection and probably being infected continuously (Awasthi .and Pande. , 1997 and Mahfouz *et al* ., 1997). Stenzel and Boreham (1996) stated that infection with with *B.hominis* may be influence by the age of patients ,their immunological status and their hygiene . The absence of difference in the incidence between age groups seen in the present study has been also observed in school –childern from Bnghazi (Raof , 2002) , from Sirt (Al-Sanousi , 2006) and other previous studies such as in Venezuela (Devera *et al.*, 1998).

High infection rates of *B.hominis* in children aged between 10-14 years was reported by Martin –Sanchez *et al.* (1992) and Eleonor *et al* .(2004) and higher prevalence rates of *B.hominis* among 18-27 years old age was reported by Requena *et al* .,(2003). On other hand

high prevalence rates of *B.hominis* infection was reported among adults than children (Stenzel *et al.* , 1989; Doyle *et al.* , 1990 ; Pistono *et al.* , 1991 ; Logar *et al.* ,1994; Requena *et al.* , 2003 ; Al-Sanousi , 2006 ; Salem ,2006 and El-Ghethmi ,2010).

5.4. Incidence and months :

The present study revealed that high incidence rate was detected in August (37%) followed by in Jun (29.6%) and in July (27.8%) and minimum incidence in May (5.6%). There was no significant relationship between the incidences in different months during this study, Babcock *et al.* (1985) reported that *B.hominis* infections may be related to the weather conditions being higher in hot weather, which agrees with this results . However Pistono *et al.* (1991) reported that the greatest incidence of *B.hominis* infection occurred during the months of January to June. Mohammed *et al.* (2007) in Sebha reported that the infection of *B.hominis* was most common during summer and suggested that dry climatic conditions favor the survival and transmission of the parasite throughout the year in the population .High prevalence of *B.hominis* has also be found more during warm and hot season of the year in other parts of the world (El-Masry *et al.* , 1990 and Suresh and Smith ,2004), in addition significant differences in the prevalence of *B.homins* between rainy and cool seasons and higher infection rate was in summer than spring and winter (Rhongbutsri,2005).On the other hand , Mercado *et al.* (1999) reported that more infected cases with *B.homins* during cold – rainy months of the year differ from that in dry –warm months .This difference was statistically significant .

5.5. Incidence of *B.hominis* and other parasites:

Mixed infection of *B.hominis* with other intestinal parasites appear to be a characteristic of this parasite .It has been reported in many previous studies (Dar and Friend 1979 ;Reinthaler *et al* ., 1988 ; Omer *et al* ., 1991 ; Chacine –Bonilla *et al.*, 1993 , Kabatereine *et al.*, 1997 ; Gamboa *et al* ., 1998 and Lee *et al* ., 2000).The mixed infection with more than one parasite was reported among schoolchildren of lower social class (Ahemed *et al.*, 1990 and Chacin – Bonilla *et al* ., 1993). On other hand inferior sanitary and environmental condition may had effect on the mixed between parasites (Michael *et al* ., 1986 and Gamboa *et al* .,1998).

The present study revealed that 51.90 % and 48.10% of infection were single and mixed infections respectively, mixed incidence of *B.hominis* with *G.lambelia* observed in the present study , was reported previously from Saudi Arabia (Al-Fayez and Khogheer ,1989); from northern Jordan (Nimri ,1993); from Venezuela (Devera *et al.*, 1998); from Maxico (Veronica *et al.*, 2003). Single infection slightly higher than mixed infection , this explained that the males are more exposure to infection than females.

The combination between *B.hominis* with *Endolimax nana* was higher followed by *B.hominis* with *D. fragilis* and *Gardia lambelia*, no helemint parasites was detected, the same association was detected in other parts of the world (Zaman *et al.*, 1995).

5.6. Incidence and nationalites:

Differences in infection between Libyan and non-Libyan patients were statistically insignificant ($p=0.885$), this agreed with results reported by Omar *et al.* (1991) and Ibrahim, (2003). This could be due to all inhabitants (Libyan and non-Libyan) were living in the same environmental conditions that cause equal chances to infection for all (Ibrahim, 2003 and Alsanousi, 2006). However, the nationality was associated with the *B.hominis* infection in Kuwait (Qadri *et al.*, 1989).

5.7. Incidence and localities:

Difference in infection between patients and outpatients from Benghazi city and those from out Benghazi was statistically significant ($p=0.081$). In the present study the infection in patients and outpatients from Benghazi was higher comparing to those out Benghazi. The locality was associated with the *B.hominis* infection reported from united states (Kappus *et al.*, 1994), north Jordan (Nimri, 1993) and Japan (Hirata *et al.*, 2007). Several factors may associated with differences between districts such as population density, socio-economic status.

Summary

6. SUMMARY

- One thousand five hundred and eighty one stool samples of patients and outpatient from some hospitals in Benghazi city were examined during the period from May to August 2008, to identified the incidence of *B.hominis* parasite.
- The methods employed to detect all form of *Blastocystis hominis* in stool specimen were (1) Direct wet mount technique, using unstained in normal saline and stained in Lougol's iodine and eosin preparations smears.(2) sedimentation method (Formalin – Ethyl Acetate method) .
- The infected cases was identified in 54 giving an overall incidence of 3.4% .Three forms of *B.hominis* were found: vacuolar forms , granular forms and cystic forms at incidence rate 81.5% (44/54) , 55.6 % (30/54) , 22.2% (12/54) respectively. No amoeboid form was detected. The study showed that mixed infection of both types of *B.hominis* (vacuolar and granular forms) at incidence rate 29.63 % (16/54).
- The incidence among males and females was 3.22 % in males and 4.2 % in females. Insignificant difference was existed between the incidence of *B.hominis* and sexes (P = 0.236).
- The incidence of *B.hominis* in different age-groups showed that the highest incidence of the *B.hominis* occurred among the age-groups of 41-50 years old at incidence rate 5.12 % . The lowest incidence was discernible in the old age groups of more than 1-10 years old 1.9 % . Insignificant difference was existed in the incidence of *B.hominis* among age groups. (P = 0.918).

- The infection of *B.hominis* was higher in July 4.6 % , the minimum incidence was detected in May 1.53 % . No significant difference between incidence and months (P = 0.336).

- *B.hominis* alone was detected in 51.90% (28/54), and *B.hominis* with another intestinal parasitic species: (*Endolimax nana* , *D.fragilis* ,*G.Lamblia* ,*C. mensili* , *E.histolytica/E.dispar* ,*E.coli* and *I.butuschlii*) at incidence rate 48.10% (26/54) .

- The combination of *B.hominis* with one parasite was observed with *E. nana* at 12.96% (7/54) , *D.fragilis* at 9. 25%(5/54) , *G. Lamblia* at 7.40% (4/54) , *E.histolytica / Edispar* at 5.55%(3/54) and with *chilomastix mensili* at 1.85% (1/54) .

-The combination of *B.hominis* with two parasites showed that *B.hominis* with *Endolimax nana* and *G. Lamblia* at 3.70% (2/54) . Followed by the combination of *B.hominis* with , *E.histolytica / Edispar* and *E.coli* at 1.85% (1/54) and the *B.hominis* with *I.butuschlii* and *E.coli* at 1.85% (1/54) . P = (0.529) .

-The incidence of *B.hominis* in Libyan patients and outpatients was 3.4% and non-Libyan 3.42 % .No significant difference was detected between the infection and nationality. (P = 0.885).

- The incidence and localities showed that the highest incidence out Benghazi patients and outpatients at incidence rates 4.45 % , the lowest incidence in out Benghazi patients and outpatients at incidence rates 3 % . There was a significant relationship between the incidence and localities(P = 0.081).

References

7. References

- Ahmad , A. (2006).** Analytical study for the epidemiology of *Giardia lamblia* parasites in Sebha City, Libya. *Sebha University Journal*. 5 (1): 43-55.
- Ahmed , M.M. ; El Hady , H .M. and Morsy ,T.A. (1990).** Parasitic infections and hemoglobin level among school children of different socioeconomic classes in Abha ,Saudi Arabia. *Journal of the Egyptian Society of Parasitology*. 20:61-67.
- Akogun, O . B and Badaki , J. (1998).** Intestinal helminth infection in two communities along the Benue river vally ,Adamawa State Nigeria. *Nigeria Journal of the Parasitology* .19 (1):67-72.
- Alexeieff , A. (1911).** Sur la nature des formation dites "kystes de *Trichomonas intestinal is*" . *Comptes Rendus des séance de la societe de Biologie* .71: 296-298.
- Al-Fayez, S. F and Khogheer ,Y.A. (1989)** .Afollowing –up study on prevalence of parasitic infection among patients attending king Abdullaziz University hospital Jedda . *Saudi Arabia Journal* .10(3):193-197.

Al-Fellani , M. A. ; Abdulrahman , O. M. ; Khan, A. H. and Abousaif, A. A . (2005). Prevalence of intestinal parasites in Sebha, Libya. *Garyounis Medical Journal*. 22 (1): 56-60.

Ali , M . B.; Ghenghesh, K. S.; Aissa, R. B.; Abohelfaia ,A. and Dufani, M . (2005). Etiology of childhood diarrhea in Zliten, Libya. *Saudi Medical Journal*. 26 (11): 1759-1765.

Al-Sanousi , F. A. (2006). Prevalence of intestinal parasites among primary schoolchildren from Sirt- Libya. MSc. Thesis. Faculty of Science , Sirt , Al-Tahadi University.

Al-Tawaty, A. J. ; Khan A. H.; Nadia I. E. and El-Buni , A. A. (2002). Screening of *Cryptosporidium* oocysts in clinical immunocompetent children. *Garyounis Medical Journal* . 19: 26-33.

Amin , A.M. (1997) . *Blastocystis hominis* among apparently healthy food handlers in Jedah Saudi Arabia. *Journal of the Egyptian Society of Parasitology*. 27 : 817-823.

Amin, O.M. (2002). Seasonal prevalence of intestinal parasites in United States during 2000. *American Journal of Tropical Medicine and Hygiene*. 66 (6):799-803

- Angel , E and Fidel ,A . N . (1995) .** *Blastocystis hominis* infection in Cuban AID'S patients. *Mm Inst Oswaldo Cruz, Riode Janeiro.* 92 (3): 321-322.
- Awasthi, S. and Pande ,V.K .(1997).** Prevalence of malnutrition and intestinal parasites in preschool slum children in Luncknow. *Indian Prediatrics*,34:599-605.
- Babcock, D.; Houston, R.; Kumaki, D. and Shlim, D. (1985)** *B.hominis* in Kathmandu. Nepal. *N. England Journal Medicine* .313 -1419
- Backer, J. and Muller, R. (1993).** *Advances in parasitology.* Academic press, London, 1st edition , 3-69.
- BenMousa , N. A. (2007).** Intestinal parasites in school aged children and the first case report on amoebiasis in urinary bladder in Tripoli, Libya. *Journal of the Egyptian Society and Parasitology.* 37 (3): 755-784.
- Ben Mousa, N. A. and Ibrahim, R. (2007).** Large term formalin preserved stool specimen for detection of intestinal parasites from school aged children in Tripoli, Lima. *Journal of the Egyptian Society of Parasitology.* . 37 (3): 1049-1054.

- Ben Mousa , N. A.; Sehari, A. and Hawas , A. (2007).** Intestinal parasitic infections among school children in Tripoli , Libya. *Journal of the Egyptian Society and Parasitology.* 3(3):1011-1016.
- Bolbol , A. S.; Warsi, M. M.; and Mabrouk, E. (1981).** The incidence of intestinal parasites in the Tripoli area of Libya. *Eben Sina Medical Association Journal.* 1 (2): 13-15.
- Boreham, P.F.L. and Stenzel, D.J. (1993).** Ultrastructure of *Blastocystis hominis* in human and animal : morphology , biology and epizootiology .*Advances in Parasitology* .32 : 1-70.
- Boreham, P.F.L.; Upcoft , J. A. and Dunn , L. A. (1992).** Protein and DNA evidence for two demes of *Blastocystis hominis* from humans. *International Journal for Parasitology* . 22:49-53.
- Brumpt, E. (1912).** "*Blastocystis Hominis* N. sp et forms voisines ". *Bulletin de la Societé de Pathologie Exotique* . 5:725-730.
- Bugharara, S. I.; Ali M. Y.; Khan A. H. and Nadia I .E. (1999).** Incidence of *Cryptosporidium* in patient with diarrhea. *Reviews Disease Parasitology.* 16 (4): 169-172.

Casemore ,D.P.(1990).Food –borne protozoal infection .Lancet .ii:1427-1432.

Cassidy ,M.F.;Stenzel, D.J and Boreham.P.F.L.(1994). Electron microscopy of surface structures of *Blastocystis sp* . from different hosts. *Parasitology* .80:505-511

Castrillo de Tirado, A.; Gonzales Mata, A.J. and Tirado Espinoza, E. (1990). *Blastocystis hominis* infection, frecuencia de infeccion por *blastocystis hominis*: un ano de studio. GEN (Caracas). 44:217-220.

Chacin –Bonilla , L.; Young ,M . M . ; Cano,G .; Guanipa ,N.; Estevez ,J . and Bonilla , E. (1993). *Cryptosporidium* infections ina suburban community in Marcaibo ,Venezuela . *American Journal of Tropical Medicine and Hygiene*.49:63 -67 .

Ciferri ,R.and Redaeli ,P.(1938). A new hypothesis on the nature of *Blastocystis Mycopathologica* .1:3-6.

Dar, F. K. and Friend ,J. E.(1979).Parasitosis in close community. A pilot study. *Garyounis Medical Journal* . 2 (2): 95-96.

Devera , R.A .; Velasquez , V.J . and Vasquez, M.J. (1998).
Blastocystis in preschool Children from Bolivar city , Venezuela .
Cadernos SaudiPublica , 14:401 -407.

Develous, M.; Alaron , A.and Boureima , S. (1989). Intestinal
parasitic infections in children in Niamey ,Niger . *Annpediatr*
.36(10):669-701.

**Diaz,I .A.; Rivero ,Z.F .;Bracho ,A.M .; Castellanos ,M.S.; Acurero
,E ., ;Calechi ,M.L. and Atencio ,R.T.(2006).**Prevalence of
intestinal parasites in children of Yukpa Ethnia in Toromo ,Zulia
state ,Venezuela .Rev.

Doyle , D.W.; Mathias, R.C. and Proctor, E. M. (1990).
Epidemiology and pathogenicity of *B.hominis*. *Journal of Clinical
Microbial*.28:116-121.

Drossman, D.A.(1979). Diagnosis of the irritable bowel syndrome
Annals. Journal of Internal Medicine 90, 431-432.

Dunn , L.A.; Boreham , P.F.L. and Stenzel, D.J. (1989).
Ultrastructural variation of *Blastocystis hominis* stocks in culture.
International Journal for Parasitology 19: 43-56.

El-Ammari, N. E. ; Hamid H. K. and Achuthan, N. (2004). Intestinal protozoan parasites among Libyan and non Libyan resident of Benghazi, Libya. *Proceeding National Academic. Science India.* 3 (74): 233-228.

El-Boulaqi H. A.; Dar F K.; and Medini, M. S. (1980). Prevalence of intestinal parasites in praimary school children in Benghazi city. *Journal of the Egyptian Society of Parasitology* . 10: 77-82.

El-Buni, A. A. and Khan, A. H.(1998).Intestinal protozoa infections in Benghazi . *Sebha Medical Journal* , 1:106 -108.

El-Buni, A. A.; Khan, A. H.; Griew, A. E. and Waliaden, Q. (1998). Prevalence of intestinal parasites among expatriates in Benghazi, Libya. *Jamahiriya Medical Science Congress, Benghazi*, 1-4 .

Eleonor ,T.B.; Vincente ,Y.B.; Winifreda ,U.D.; Hyun ,H.K.and Dong,C.(2004).Infection status of intestinal parasites in children living in residential institutions in Metro Malino . The Philippines .*Korean Journal of Parasitology* .42:67-70

El-Ghethmi ,N .M .(2010) Intestinal parasitic infections among primary school children in Tripoli .MSC .Thesis , Faculty of Science , University .

El-Gindy, M. S. and El-drissy, A. W. (1975). Present situation of schistosomiasis in the Libyan Arab. Republic. Bilharzianis in Ubari district in Fezzan (Sebha Governate). *Egyptiont Journal of the Bilharz*. 2(1): 117-130.

El-Masry, N.A.; Bassily, S.; Farid, F. and Aziz, A.G. (1990). Potential clinical significance of *Blastocystis hominis* in Egypt. *Transactions of the Royal Society of Tropical Medicine and Hygiene* .84- 695.

Escobedo ,M.A .; Nuria Homedes , M.D.; Katherine Vonalt , B.A.;Serrano , B.N. and Robert Garcia , M.P. (2003). Assessment of parasitic diseases in children in five communities in the border region of far west Texas .*Department of Health* .56:113-115.

El-Shazly, A. M.; Abdel-Magied, A .A.; El-Beshbishi ,S.N.; El-Nahas , H.A. ;Found, M.A. and Monib, M.S. (2005). "*Blastocystis hominis* among symptomatic and asymptomatic individuals in Talka Center, Dakahlia Governorate, Egypt" *Journal of the Egyptian Society of Parasitology* .35 (2): 653-66.

Enzenauer, R.J. ; Underwood, G. H. and Ribbing, J. (1990) . Tropical pulmonary eosinophilia. *South Medicine Journal* . 83(1):69–72.

- Figueroa, L.; Moraleda, L. and Garcia, N. (1990).** Enteroparasitosis en niños con síndrome diarreico agudo de la ciudad de Valdivia, X region, Chile con especial.
- Gamboa ,M .I.; Basualdo , J. A.; Kozubsky ,L.; Costas , E.; Cueto Rua , E and Lahitte , H. B.(1998).** Prevalence of intestinal parasitosis within three population groups in La Plata , Argentina. *European Journal of Epidemiology* .14 :55-61.
- Garavelli, P.L.; Scaglione, L.; Bicocchi, R. and Libanore, M. (1991).** Pathogenicity of *Blastocystis hominis* Infection. 19(3):185.
- Garavelli , P.L.; Scaglione, L.; Merighi ,A. and Libanore, M. (1992)** .Endoscopy of blastocystosis (Zierdt-Garavelli disease). *Italy Journal of Gastroenterol.* 24(4):206.
- Garavelli, P.L.; Scaglione, L.; Rossi, M.R.; Bicocchi, R. and Libanore, M. (1989)** .Blastocystosis in Italy. *Annales de Parasitologie Humaine et Comparee.*;64(5):391–395
- Garcia, L.S.; Bruckner, D.A.(1997)** .Diagnostic Medical Parasitology . 3rd edition ,ASM. Press , Washington.

Garcia, L.S.; Bruckner, D.A. and Clancy, M.V. (1984). Clinical prevalence of *Blastocystis hominis*. *Lanceti*. 1233-1234.

Gebreel ,A.; Gilles H.M. and Prescoh, J.E. (1985) Studies on the sero-epidemiology of endemic diseases in Libya . Schistosomiasis . *Annal Tropical Medicine and Parasitology* .79(1):31-41

General Authority For Information and yearly Bulletin (2008). Statistics book . Tripoli. Libya .35-47.

Graczyk,T.K.; Shiff ,C .K. ; Taman, L .; Munsaka, F.; Beitin ,A.M. and Moss ,W. J. (2005).The association of *Blastocystis hominis* and *Endolimax nana* with diarrhea stools in Zambian school –age children .*Parasitology Research* , tgraczyk @ jhsph.edu.

Guignard, S.; Aruebtu, A .M.; Freyer ,L. ; Lujan, H and Rubinstein, .H. (2002). Prevalence of enteroparasites in a residence for children in the cordoba province . Argetina . *Europe Journal Epidemiology* .16 :287 -293

Guirges, S.Y and Al-Waili , N.S. (1987). *Blastocystis hominis*: evidence for human pathogenicity and effectiveness of metronidazole therapy. *Clinical Experimental Pharmacology and Physiology*. 14(4):333–335.

- Gupta ,R .and Parsi ,K.(2006).** Chronic urticaria due to *Blastocystis hominis* . *Australian Journal of Dermatology* .47:117-119.
- Hahn, P. and Fleischer, N.(1985).** *Blastocystis hominis* is it of clinical importance . *Tropical Medicine and Parasitology*. 36:7–8.
- Haider, S . (2008).** Detection of *Blastocystis hominis* in human and poultry . *Infectious Disease Journal*. 17 (2):43-7 .
- Henry ,M. ; Clercq , D. ; Lokombe, B.; Kayembe ,K.; Kapita, B.; Mamba , K.; Mbendi, N. and Mazebo, P. (1986).** Parasitological observations of chronic diarrhoea in suspected AIDS adult patients in Kinshasa (Zaire). *Transations Royal Society of Tropical Medicine*.
- Hirata ,T. ; Nakamura, H. and Kinjo , N.(2007).** Prevelance of *Blastocystis hominis* and *Strongloides stercoralis* infection in Okinawa Japan. *parasitology Research* .101 : 1717.
- Hokelek , M.(2007).**Is *Blastocystis hominis* an opportunist agent? .*Turkiye Parazitology Dergis*.31 (1):28-36
- Ibrahim ,H. A.(2003)** Intestinal parasite infection among the children and neonates admitted in Iben –Sina Hospital, Sirt , Libya MSc . Thesis , Faculty of Science,Al-Tahadi University .

- Iqbal , J.; Hira, P.R.; Al-Ali ,F. and Philip ,R. (2001).** Cryptosporidiosis in Kuwait children :*Clinical Microbiology and Infection* .7:261 -266.
- Jeddy, T.A. and Farrington, G .H . (1991)** *Blastocystis hominis* complicating ulcerative colitis. *Journal Revista da Sociedade de Medicina*. 84(10): 623–623.
- Kabatereine , N.B.; Kemijumbi, J.; Kazibwe, F. and Onapa, A.W. (1997).** Human intestinal parasites in primary school children in Kampala , Uganda .*East African Medical Journal* .74 :311-314.
- Kain, K. C.; Noble, M. A.; Freeman, H.J. and Barteluk , R. L. (1987).** Epidemiology and clinical features associated with *Blastocystis hominis* infection. *Diagnostic Microbiology and Infectious Disease*. 8: 235-244.
- Kappus , K. D ; Lundgren, R .G.; Juranek, D.D.; Robert,J .M .and Spencer, H. C. (1994)** .Intestinal parasitism in the United States .*American Journal of Tropical Medicine and Hygeine*.50 (6):705-713.
- Kara, W.M.; El-Heggiagi, M.B. and Shaban, A.O .(2006).** Cryptosporidiosis among children in Tripoli . *Journal of the Egyptian Society Parasitology*.36(1):107-112 .

- Khalifa ,A.M.(1999):**Diagnosis of *Blastocystis hominis* by different staining techniques. *Journal of the Egyptian Society Parasitology* .29(1):157-165
- Khalifa, A.M.; El -Temsahy, M.M. and El- Naga, I.F. (2005).** "Effect of ozone on the viability of some protozoa in drinking water". *Journal of the Egyptain Society of Parasitology*. 31 (2): 603-16.
- Khan ,A.H.,Al-fellani , M.A.;Rugia ,D.and Omran, A. (2008) .**A comparsion of three different methods for the diagnosis of *Blastocystis hominis* .*Jamahriya Medical Journal* .8(1):31-34.
- Kormos ,J. ; Kormosk, K (1958).** Die zellteilung-stypen de protozoen. *Acta Boil Acad Scihung aricae*. 8: 127.
- Koustavils,A., Valiquette, L.;Allard, R . and Soto J(2001).** *Blastocystis hominis*: a new pathogen in day care center . *Can Commum Disease Report*.27(9):76-84.
- Lakhanpal ,S.; Cohen, S. and Fleischmann, R.M. (1991).** Reactive arthritis from *Blastocystis hominis*. *Arthritis Rheum*. 34(2):251–253.

- Lanuza , M.D .; Carbajal , J. A.; Villar ,J . and Borrás ,R.(1997).***Blastocystis hominis* :Intestinal Pathogen *Annals Medical International* .14(9):490.
- Lebar, W.D.; Larsen ,E.C .and Patel , K (1985).** Afebrile diarrhea and *Blastocystis hominis*. *Annals Medical International*. 103(2):306.
- Leder ,K.; Hellord ,M.E; Sinclair ,M.I.; Fairly ,C.K. and Wolfe ,R .(2005)** .No correlation between clinical symptoms and *Blastocystis hominis* in immunocompetent individuals . *Journal Gastroenterol Hepatal*.20:1390-1394.
- Lee , M.J.(1991).** Pathogenicity of *Blastocystis hominis* *Journal Clinical Microbiology*. 29 :151 -154.
- Lee, K. J.; Ahn,Y. K. and Yong, T. S. (2000)** . A small-scale survey of intestinal parasite infections among children and adolescents in Legaspi city, the Philippines. *Korean Journal of Parasitology*, 38(3): 183-185.
- Leelayoova, S.; Taamasri, P.; Rangsin, R.; Naaglor, T.; Thathaisong, U .and Mungthin, M. (2002).** "In-vitro

cultivation: a sensitive method for detecting *Blastocystis hominis*".
American Tropical Medicine Parasitology. 96 (8): 803-7.

**Levine , N.D; Corliss , J.O ; Cox , F.E; Deroux, G; Grain, J;
Honigberg, B.M ; Leedale, G.F; Loeblich, A.R; Lom, J; Lynn,
D; Merinfeld, E.G. (1980).**Anewly revised classification of
protozoa. *Protozool*.(27:37-58).

**Libanore, M. ; Rossi, M.R.; Scaglione, L. and Garavelli,
P.L.(1991).** Outbreak of blastocystosis in institution for the
mentally retarded. *Lancet*. 337(8741):609–610.

Libre , J.M.;Tor , J .M ., Carbonell ,C. and Foz ,M .(1989).
Blastocystis hominis chronic diarrhea in AIDS patients *.Lancet*
.1:221.

Logar ,J.;Andlovie ,A. and Poljsak –Priatelj ,M.(1994). Incidence of
Blastocystis hominis in patients with diarrhea *.Journal infection* .28
:151-154.

Magambo, J. K .; Zeyhle, E .and Wachiria, T.M.(1998) .Prevalence
of intestinal parasites among children in southern sudan . *East
African medical journal*. 75 (5):288-90.

- Mahdi, N. K. and Ali, N. H. (2002).** Intestinal parasite including *cryptosporidium* species, in Iraqi patient with sickle-cell anemia. *Eastern Mediterranean Health Journal*, 8(2&3): 40-42.
- Mahfouz , A.A.; El –Morshedy, H. and Farghaiy, A. (1997).** Ecological determinants of intestinal parasitic infections among pre school children in an urban squatter settlement of Egypton *.Journal of Tropical Pediatrics* .43:341 -344.
- Mahmoud , M.S. and Saleh, W.A.(2003).** Secretary and humoral antibody responses to *Blastocystis hominis* in symptomatic and asymptomatic human infections *.Journal of the Egyptian Society Parasitology* .33 (1) 13-30.
- Martin-Sanchez , A.M.; Canut-Blasco ,A .; Rodriguez-Hernandez, J.A.(1992).** Epidemiology and clinical significant of *Blastocystis hominis* in different population groups in Salamanca (spain). *Euopian Journal Epidemiology* . 8 (4):553-559.
- Mati, C .R. (1995) .** Aconcise note on medical laboratory on medical laboratory technology .New central book agency Cp Ltd . Cakulata .131-158.

- Matsumoto, Y.; Yamada, M. and Yoshida, Y. (1989).** Light microscopical appearance and ultrastructure of *Blastocystis hominis*, an intestinal parasite of man Zentralblatt fur Bakteriologie, *Microbiologie und Hygiene*. A264, 379-385.
- Mehlhorn, H. (1988).** *Blastocystis hominis*, Brumpt 1912: are there different stages or species. *Parasitology Research*. 74, 393-395.
- Mercado, R. and Arias, B. (1991).** *Blastocystis hominis*: frecuencia de infection en pacientes ambulatorios de sector norte de Santiago, chile. *Boletin chileno de parasitologia*. 46, 30-32.
- Mercado, R.; Otto, J.P and Perez, M.(1999).** Seasonal variation of intestinal protozoan infections in outpatients of the north section of Santiago, *Chil. Parasitology* .54(1-2):41-44.
- Micheal, P.; Udkow, M. and Markell, K. (1986)** *Blastocystis hominis*: Prevalence in versus symptomatic Host. *Journal of Infectious Disease* . 168:247-4.
- Minvielle, M .C .; Pezzani, B.C.; Cordoba, M.M.; Apezteguia, M.C. and Basualdo, J.A. (2004).** Epidimological survey of *Giardia spp.* And *B.hominis* in an argentinian rural community . *Korean Journal parasitology* .42(3) :121-127.

Moe ,K.T.; Singh ,M.; Howe ,J.; Ho,L.C.; Tan ,S.W.; Chen, X.O.; Ng,G.C. and Yap ,E.H. (1997). Experimental *Blastocystis hominis* infection in laboratory mice. *Parasitology Research* .83(4):319-325.

Mohammed , A.; Lubna, A.A. and Faten, A.(2007) .Prevalence of pathogenic intestinal parasites among Saudi rural school children .*European Journal Puplic Health* .4(3):232-236.

Molly ,A. (1993) Prevalence and characteristic of *B. hominis* infection in children .*Clinical Pediatrics of Parasitology* .31 (2): 603-16.

Narkewicz, M. R.; Janoff, E. N.; sokol, R.J. and Levin, M. J. (1989). *Blastocystis hominis* gastroenteritis in hemophiliac with acquired immune deficiency syndrome. *Journal of Pediatric Gastroenierology and Nutrition*. 8: 125-128.

Nascimento, S .A. and Moitinho, M.L.R (2005).*Blastocystis hominis* and other parasites in a community of Pitanga city Parana State Brazil .*Revista do Instituto de Medicine Tropical Sao Paulo*. 47 :213 -217.

Neva ,F.A. and Brown ,H.W.(1994). Basic Clinical Parasitology. Appleton and Lavgpe .Norwalk ,Connecticut.,U.S.A.

- Nimri, L. F. (1993).** Evidence of an epidemic of *Blastocystis hominis* infections in preschool children in northern Jordan. *Journal Clinical Microbiology*. 31:2706-2708.
- Nimri, L. and Batchoun, R. (1994).** Intestinal colonization of symptomatic and asymptomatic schoolchildren with *Blastocystis hominis*. *Journal of Clinical Microbiology*. 32(11):2865–2866.
- Noel, C.; Peyronnet, C.; Gerbod, D.; Edgeomb, VP., Delgado – Viscogliosi, P.; Sagin, M.L.; Capron, M., Viscogliosi, E. and Zenner, L.(2003)** . Phylogenetic of *Blastocystis hominis* isolates from different hosts based on the comparison of small-subunit rRNA gene sequences . *Molecular Biochemistry Parasitology* .126 :119 -253 .
- Omar, M.S.; AbuZeid, H.A. and Mahhfouz, A.A. (1991).** Intestinal parasitic infections in schoolchildren of Abha (Asir). *Saudi Arabia Acta Tropica* .48:195 -202.
- Ozcakir, O.; Gureser, S.; Erguven, S.; Yilmaz, Y.A.; Topaloglu, R. and Hascelik, F. (2007).** Characteristic of *Blastocystis hominis* infection in a Turkish university hospital. *Turkiye in a Turkish university hospital. Turkiye parazitology Dergrisi*. 31 (4): 277-82.

- Parkar, U. ; Traub, R. J. and Kumars, L . (2007).** "Direct characterization of *Blastocystis* from feces by PCR and evidence of Zoonotic potential". *Parasitology*. 134 (3): 359-67.
- Pistono, P.G .; Dusi ,M.P.; Ronchetto, F.; Cestonaro ,G. and Guasco, C.(1991).** *Blastocystis hominis* in Canavese: a retrospective study of samples received for fecal parasitological examination at the Ivrea- Castellamonte Hospital over 42 months . *Giornale di batteriologia virologia ed immunologia* .84(1-12):67-76.
- Qadri, S. M. ; Al-Okaili, G. A. and Al-Dayel, F. (1989).** Clinical significance of *Blastocystis hominis*. *Journal of Clinical Microbiology* .27: 2407-2409.
- Rajah , S.R.H., Suresh , K.G .; Vellayan, S; Mak ,J.W.; Khairul ,A.A ;Init ,I .;Vennila ,G.D.; Saminathan , R. and Ramakrishnan ,K . (1999).** *Blastocystis* in animal handlers *Parasitology Research*. 85 (12):1032 -1033.
- Raof, S. A. (2002).** Intestinal Archezoa and protozoa of primary schoolchildren from Benghazi: An investigation relating to the effect of sociodemographic and environmental Variables on parasitic infection. MSc. Thesis faculty of science, Garyouns University.

Reinthal, F.F.; Mascher, F .; Klem, G .and Sixl ,W.(1988). A survey of gastrointestinal parasites in Ogun State, southwest Nigeria. *Annal Tropical Medicine Parasitology*. 82(2):181–184

Requena ,I.; Hernandez ,Y . Ramsay ,M ., Salazar ,C. and Devera ,R.(2003): Prevalence of *Blastocystis hominis* among food handles from Caroni municipality , Bolivar stat ,Venezuela.*Cad .Saude . Pubika* .19: 1712 -1727

Rhongbutsri ,P .(2005). Seasonal prevalence of *Blastocystis hominis* among patients attending Thammasat Chalermprattit hospital ,Pathum , Thani province . Thailand. *Journal Tropical Parasitology* .28:39 -42

Ricci, N.; Toma, P.; Furlani, M.; Caselli ,M. and Gullini ,S. (1984) .*Blastocystis hominis*: a neglected cause of diarrhea Lancet. 28:1(8383):966.

Rugaia ,M .(2006) .Astudy of *Blastocystis hominis* by direct smear and culture method in Sebha .MSc. Thesis , Sebha University ,Sebha ,Libya .

- Russo, A. R.; Stone, S. L.; Taplin, M. E.; Snapper, H. J. and Doern, G.V. (1988)** .Presumptive evidence for *Blastocystis hominis* as a cause of colitis. *Archives of Internal Medicine* .148(5):1064.
- Sadaga, G. A. and Kassem, H.H. (2007)**. Prevalence and intestinal parasite among primary schoolchildren in Derna District, Libya. *Journal of the Egyptian Society Parasitology* .37 (1):205-214.
- Salem, R. A.; Abdullah, M. E. and Abdulgader, A. E. (2006)**. Intestinal protozoa in Libya patients in Sirt. *Jamahiriyah Medicine Journal*. 6 (1): 59-61.
- Scaglione, L.; Ansaldi, E.; Troielli, F. and Garavelli, P.L. (1990)**. *Blastocystis hominis* infection in patients with diabetes mellitus. Clinical case history. *Recenti Progressi in Medicina*. 81(7-8):482–485
- Sheehan, J.P. and Ulchaker, M.M.(1990)**. *Blastocystis hominis* treatable cause of diabetic diarrhea. *Diabetes Care*. 13(8):906–907.
- Shilm, D. R.; Hoge, C.W.; Rajah, J. G.; Rabold, and Echeverria, P. (1995)**. Is *Blastocystis hominis* a cause of diarrhea in

travelers A prospective controlled study in Nepal. *Clinical Infectious Disease*. 21:97–101.

Silard , R. and Burghilea, B. (1985). Ultrastructural aspects of *Blastocystis hominis* strain resistant to antiprotozoal drugs. *Archives Roumaines de Pathologie Experimentale et de Microbiologie*. 44(1):73–85.

Singh , M .; Suresh, K.; Ho, L.C .; Ng ,G.C. and Yap, E. H (1995) . Elucidation of the life cycle of intestinal protozoan *Blastocystis hominis* .Parasitology Research. 81:446-450.

Stenzel, D.J. and Boreham, P.F.L. (1991). A cyst-like stage of *Blastocystis hominis*. *International Journal for Parasitology* 21 : 613-615.

Stenzel, D.J. and Boreham, P.F.L. (1993). Ultrastructure of *Blastocystis hominis*. *Journal of Computer Assisted Microscopy*. 5 :13-16.

Stenzel , D.J. and Boreham P.F.L. (1996). *Blastocystis hominis* revisited. *Clinical microbial of Reviews*. 9: 563-584.

Stenzel, D.J.; Dunn, L.A. and Boreham, P.F.L. (1989). Endocytosis in culture of *Blastocystis hominis*. *International Journal for Parasitology*. 19 :787-791.

- Sun ,T. ; Katz ,S .; Tanenbaum , B. and Schenone , C.(1989).** Questionabl Clinical significance of *Blastocystis hominis* infection . *American Journal Gasteroenterol* .84:1543-1547.
- Suresh, K . and Smith, H. (2004).** "Comparison of methods for detecting *Bastocystis hominis*". *Europ Journal of Clinical. Microbiol. Infectious Disease*. 23 (6): 509.
- Suresh, K.; Chong , S.; Howe , J.; Ho, L.C.; Yap , E . and Singh ,M.(1995) . Tubulovesicular elements in *Bastocystis hominis*".** From caecum of experimentally –infected rats . *International Journal for Parasitology* . 25(1):123-126.
- Suresh, K. Smith, H.V. and Tan, T.C. (2005).** Viable *Blastocystis* cysts in Scottish and Malaysian sewa. *Apply Environ Microbial*. 71 (9): 5619-5620.
- Taamasri , P. (2002).** Prevalence of *Blastocystis hominis* carriage in Thai army personnel based in chonburi, thaliland. *Military Medicine* . 167:643–646.
- Tan, H.K.; Harrison, M. and Zierdt, C.H. (1974).** Freeze-etch studies of the granular and vacuolated forms of *Blastocystis hominis*. *Zeitschrift fur Parasitenkunde* 44: 267-278.

Tan, k. S. ; Singh, M. and Yap, E. H . (2002). Recent advances in *Blastocystis hominis* incognita. *International Journal for Parasitology*. 32: 789-804.

Tan, T.C. and Suresh, K.S. (2007) . Predominance of amoeboid forms of *Blastocystis hominis* in isolates from symptomatic patients . *Parasitology Research* .98 (3):189-93.

Telalbasic, S.; Pikula, Z.P. and Kapidzi, M. (1991) .*Blastocystis hominis* may be a potential cause of intestinal disease . *Scandinavian Journal of Infectious Disease* .23:389-390.

Torres P .,Miranda ,J.C.; Flores ,L.;Riquelme , J.; Franjola ,R.;Perez ,J.; Auda,S.; Hermosilla, C. and Riquelme,S.(1992).
Blastocystis and other intestinal protozoan infections in human riverside communities from Valdivia River Basin ,Chile .*Rev.Inst . Medical Tropical* .Sao Paulo. 34:557-564.

Udkow, M. P. and Markell , E. K. (1993). *Blastocystis hominis*: prevalence in asymptomatic versus symptomatic hosts. *Journal of the Infectious Disease*. 168:242–244.

- Van Saunen-Ciurea, M. and El-Achachi, H. (1983).** *Blastocystis homiuis*: etude morphologieque par microscopie optique et electromique. *Bulletin de la Societe de Pathologie Exotique* 76, 766-776.
- Veronica C.; Agustin P.;Cristina M.; Silvia V.; Gustavo R.; Leopoldo , F. (2003).** *Blastocystis hominis* among food vendors in Xochimilco markets. *Revistal Latino ame, icana de microbiologia*, 45 (1-2): 12-5.
- Walker, J.C.; Bahr , G. and Ehl, A.S. (1985)** .Gastrointestinal parasites in Sydney.*Medical Journal of Australia*. 11;143(10):480–480.
- Wang,K.X. , Licp , S.;Wang ,J. and Cui ,Y.B.(2002).**Epidemological survey of *Blastocystis hominis* in Huanian City , Anhui province ,China .*World Journal Gastroenterol* .8(5):928-932.
- Wenyon, C.M. (1917).**A new flagellate *Macrostoma menili* sp. From the human intestine, with some remarks on the supposed cysts of *Trichomonas*. *Parasitology* 3:210-216.

World Health Organization (1991). Basic Laboratory Methods in Medical Parasitology. World Health Organization Publications, Geneva.

Yaicharoen R .; Sripochang S .; Sermsart , B . and Pidetch, P. (2005). Prevalence *B.homins* infection in symptomatic individuals from Bangkok Thailand .*South Asian Journal Tropical Medicine*.36.

Yakoob, J.; Jafri ,W.; Jafri, N.; Islam, M. and Asim Beg ,M. (2004). Invitro susceptibility of *Blastocystis hominis* isolated from patients with irritable bowel syndrome. *Sci.* 61 (2):75-7.

Yoshikawa, H.; Abe, N.; Iwasawa, M .; Kitano, S.; Nagano, I. and Takahashi, Y. (2000). Genomic Anaylsis of *Blastocystis hominis* strain Isolated from two long – Term Health care Facilities. *Journal of Clinical Microbiology.* 38(4): 1324-1330.

Yoshikawa, H.; Yamada, M. and Yoshida, Y. (1988). Freeze-fracture study of *Blastocystis hominis*. *Journal of Protozoology.* 35(4):522–528.

Zaki, M.; Daoud, A.S; Pugh, R.N.; Al-Ali ,F.; Al-Mutairi ,G. and Al-Saleh, Q. (1991). Clinical report of *Blastocystis hominis*

infection in children. *Journal of Tropical Medicine and Hygiene* .
94(2):118–122.

Zaman, V. and Howe, J. and Ng,M (1995) .Ultrastructure of
Blastocystis hominis cysts .*Parasitology Research*. 81(6): 465-9.

Zeibig (1997). Clinical Parasitology. A practical approach.1 edition.
W.B.Saunders Company, Philadelphia.

Zhang, H.W.; Liw, Y . Q. and Sayp, H . L. (2006) .Impact of
blstocystis hominis infection on ultrastructure of intestinal mucosa
in mice. *The Chinese. Zhonggue Jisheng chong xue Ya Jisheng
chong Bing Za Zhi* .24 (3): 187-91.

Zierdt, C.H . (1967). Protozoa characteristic of *B.hominis* . *American
Journal of the Clinical Pathology*. 48:495-50 .

Zierdt, C.H.(1983). *Blastocystis hominis*,aprotozan parasite and
intestinal pathogen of human beings . *Clinical Microbial News*
.5:57-59.

Zierdt, C.H.(1991a). Pathogenicity of *Blastocystis hominis*. *Journal
Clinical Microbial*. 29(3): 662-3 .

Zierdt ,C.H. (1991b). *Blastocystis hominis* – past and future. *Clinical
Microbial of Reviews*. 4 (1): 61-79.

- Zierdt, C.H . and Nagy, B. (1993).** Antibody response to *Blastocystis hominis* infections, *Annales International Medicine* .118 (12): 985-6.
- Zierdt, C.H.; Rude ,W.S. and Bull, B.S.(1967) .** Protozoan characteristics of *Blastocystis hominis* .*American Journal Clinical Pathology* .48:495-501.
- Zierdt, C.H.; Swan, J.C. and Hosseini, J .(1983).** In Vitro response of *Blastocystis hominis* to antiprotozoal drugs. *Journal Protozoology* 30(2): 332-4.
- Zierdt, C.H. and Tan, H.K. (1976).** Ultrastructure and light microscope appearance patient with enteric disease .*Parasitenkd* .50 :277-283.

Index

جامعة بنغازي - كلية العلوم - قسم الحيوان

الهدف : دراسة معدل حدوث الاصابه بطفيل *Blastocystis hominis* بين المرضى و
المتكردين لبعض المستشفيات في مدينة بنغازي

(ملاحظة : ضع علامة في المربع للإجابة المناسبة)

التاريخ : / /
الوقت:

- مكان تجميع العينة :
- رقم العينة :
- العمر :
- الجنس : ذكر انثى
- الجنسية :
- العنوان :
- المستوى التعليمي :
- الدخل الشهري للأسرة :
- عدد أفراد الأسرة :
- ما هو سبب طلب هذا التحليل :
- هل لديك أي مرض تعاني منه :

(1) Patient type : out () in ()

(2) physical nature of stool specimen:

A- consistency degree of moisture :

- a- Formed ()
- b- Semi formed ()
- c- Liquid ()
- d- Loose ()
- e- Hard ()

B- colour :

- a- Black ()
- b- Brown ()
- c- Yellow ()
- d- Yellowish ()
- e- Bright – red ()
- f- Green ()
- g- Clay colour ()

C- mucous +ve () -ve ()

D- Blood: +ve () -ve ()

(3) Diagnosis :

Parasite

- 1-
- 2-
- 3-
- 4-
- 5-
- 6-
- 7-
- 8-
- 9-
- 10-

□ الخلاصة باللغة العربية

الخلاصة

تم فحص ما مجموعه 1581 عينة براز من المرضى والمتردددين (1301 ذكور و 280 إناث) على بعض مستشفيات بمدينة بنغازي (مستشفى الجمهورية و مستشفى الفاتح و جراحة الاطفال)، ذلك في الفترة من مايو إلى أغسطس 2008 لتحديد حدوث انتشار طفيل الـ *B. homini* من بين هؤلاء المرضى.

- اعتمدت هذه الدراسة للكشف عن تواجد طفيل *B. hominis* والطفيليات المعوية الاخرى في عينات البراز بالطرق التالية:

أ- الفحص المباشر لمسحة من البراز باستخدام محلول الملحي ومحلول Lougol's أيودين وصبغة الأيوسين .

ب- استخدام تقنية الترسيب (Sedimentation (Formalin Ethyl Acetate)

- دلت نتائج فحص 1581 عينة عن وجود ثلاثة اشكال من الطفيل *B. hominis* في 54 (3.4%) وهي:

(الفجوي) (Vacuoar form) ، (الحبيبي) granular form و (المتكيس) cystic form بمعدل 81.5% (54/44) , 55.6% (54/30) , 22.2% (54/12) على التوالي . كما أظهرت الدراسة على اصابة مختلطة بين شكلين من الطفيل Vacuoar form (المجوف) ، granular form (الحبيبي) بمعدل 29.63% (54/16).

- أظهرتالنتائج أن معدل انتشار الطفيلي في عينات البراز للمرضى والمتردددين كانت في ذكور 3.22% و الأنث 4.2% , ولم يكن هناك اختلافات معنوية بين الجنسين والإصابة (P = 0.236)

- لقد كان انتشار الطفيلي *B.homini* في اعلي معدلاته في الفئة العمرية 41-50 سنوات 5.12 % ، بينما كان الطفيلي في ادني معدلاته في الفئة العمرية 1-10 1.9 % ، هناك عدم وجود فروق معنوية في نسبة انتشار الطفيل والمجموعات العمرية المختلفة (P = 0.918).

- أظهرت النتائج اعلي معدلات الاصابة في شهر يونيو 4.6 % ، وكانت أقل نسبة في شهر مايو 1.53 %، دلت النتائج انه لا توجد هناك اختلافات معنوية تبعاً لاختلاف الشهور (P = 0.336).

اوضحت النتائج اصابة 51.9 % من الحالات المفحوصة بالطفيلي في إصابة مفردة (الطفيل فقط) و 48.1 % مصاب بأكثر من طفيل

أكثر الطفيليات المعوية المتواجدة مع طفيل *B.homini* هي:

G. lamblia , (54/5) 9.25% *D. fragilis*, (54/7) 12.96% *E. nana* (54/4) 7.40% ثم يليها *E. histolytica/ Edispar* , (54/3) 5.55% ثم *I. butshlii* و *C. mensili* 1.85 % (54/1) ، كما أظهرت النتائج تواجد طفيل *B.homin* مع اكثر من طفيل : *B.hominis* و *G. lamblia* و *E. nana* 3.7 % (54/2) يليها *B.hominis* و *E. histolytica/ E. dispar* و *E. coli* 1.85 % (54/1) ثم *B.hominis* و *I. butshlii* و *E. coli* 1.85 % (54/1). ولم تسجل وجود ديدان مع الطفيل حيث كان هناك عدم وجود فروق معنوية بين الإصابة المفردة والاصابة المختلطة (P = 0.529)

- أظهرت انتشار طفيل *B.hominis* بين المرضى والمتكردين علي المستشفيات % من الليبيين و % غير الليبيين، ولم تسجل اختلافات معنوية بين معدل الإصابة المرضى والمتكردين الليبيين وغير الليبيين ($p = 0.885$).

- أما فيما يتعلق بنسبة الانتشار حسب منطقة إقامة المريض او المتكرر في مدينة بنغازي أو خارجها فقد كانت أعلى معدلات الإصابة في المرضى والمتكردين المقيمين من خارج مدينة بنغازي 4.45% من داخل مدينة بنغازي 3% ، وكان هناك اختلافات معنوية بين الإصابة بالطفيل ومكان الإقامة ($P = 0.081$).

لقد نوقشت نتائج هذه الدراسة ضمن إطار التأثيرات المتداخلة الشاملة للعوامل المؤثرة على مدى انتشار طفيل *B.hominis* واستنتج أنه من الضروري القيام بالدراسة في فترات مناسبة.