

# Parasitic Infections and Host Tissue Response in Histopathology: A Rare Retrospective Research Study from Rural India

*Histopatolojide Paraziter Enfeksiyonlar ve Konak Doku Yanıtı: Kırsal Hindistan'dan Nadir Bir Retrospektif Araştırma*

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## ABSTRACT

**Objective:** Parasite are living organisms which survive on another living being for their nourishment and survival. When these parasites resides on human body, they bring about inflammatory response. This inflammatory response leads to tissue reaction. Tissue response on microscopy appear as an eosinophilia, abscess and granulomas. This study was planned with the objective to know the frequency of parasite infection, tissue response in parasite infection and its comparison in terms of variables like age, sex and the type of parasite.

**Methods:** This is a retrospective study, conducted in the department of pathology. A total of 26 cases of parasitic infections in human specimens reported in our department from January 2008 to December 2019 were included in this study. On all archived cases hematoxylin and eosin and where ever required periodic acid schiff was applied. These slides were thoroughly examined and clinicopathological correlation was studied.

**Results:** Age range of patients was 5 years to 70 years. Maximum number of patients were belonging to 11-20 year age group. Male to female ratio was 1:2. Among the 26 cases, there were 9 cases (34.62%) of hydatid cyst, six cases of *Entamoeba histolytica* (23.07%), four cases of *Enterobius vermicularis* (15.38%), and two cases (7.69%) each of *Ascaris lumbricoides*, filaria and cysticercosis respectively. A specific tissue response seen in cysticercosis having chronic inflammatory cells, palisaded epithelioid cells granuloma and giant cell reaction while other showed inflammatory cells infiltration.

**Conclusion:** Clinically diagnosis of parasitic infection in each and every case is not possible, similarly radiological investigation is also suggestive only. Histopathology examination is the benchmark investigation to diagnose parasite infection and tissue reaction to the host. Histopathology examination must be implicated in every case to identify parasite and tissue reaction so that the patients can be managed accordingly before the complications rises.

**Keywords:** Parasite, histopathology, tissue reaction

## ÖZ

**Amaç:** Parazit, beslenmek ve hayatta kalmak için başka bir canlı üzerinde hayatta kalan canlı organizmalardır. Bu parazitler insan vücudunda bulduklarında iltihabi tepkiye neden olurlar. Bu enflamatuvar yanıt doku yanıtına yol açar. Doku yanıtı mikroskobik olarak eozinofili, apse ve granülomlar şeklinde görülür. Bu çalışma, parazit enfeksiyonu sıklığını, parazit enfestasyonunda doku yanıtını ve yaş, cinsiyet ve parazit türü gibi değişkenler açısından karşılaştırılmasını bilmek amacıyla planlanmıştır.

**Yöntemler:** Bu çalışma patoloji anabilim dalında yürütülen retrospektif bir çalışmadır. Ocak 2008'den Aralık 2019'a kadar bölümümüze bildirilen insan örneklerinde görülen toplam 26 parazit enfeksiyonu olgusu bu çalışmaya dahil edilmiştir. Arşivlenen tüm olgulara hematoxylin ve eosin ve gerekli durumlarda periyodik asit schiff uygulanmıştır. Bu lamalar ayrıntılı olarak incelenmiş ve klinikopatolojik korelasyon çalışılmıştır.

**Bulgular:** Hastaların yaş aralığı 5 ile 70 arasında değişmekteydi. En fazla hasta 11-20 yaş grubuna aitti. Erkek/kadın oranı 1:2 idi. Yirmi altı olgu arasında sırasıyla 9 olgu (%34,62) kist hidatik, altı olgu (%23,07) *Entamoeba histolytica*, dört olgu (%15,38) *Enterobius vermicularis* ve ikişer olgu (%7,69) *Ascaris lumbricoides*, filaria ve sistiserkoz vardı. Sistiserkozda kronik enflamatuvar hücreler, palizatlanmış epitelioid hücre granülomu ve dev hücre reaksiyonu gibi spesifik bir doku yanıtı görülürken, diğerlerinde enflamatuvar hücre infiltrasyonu görülmüştür.

**Sonuç:** Her olguda parazit enfestasyonunun klinik olarak teşhisi mümkün değildir, benzer şekilde radyolojik inceleme de sadece düşündürücüdür. Histopatoloji incelemesi, parazit enfestasyonunu ve konakçıya karşı doku reaksiyonunu teşhis etmek için kriter incelemesidir. Parazit ve doku reaksiyonunu tanımlamak için her olguda histopatoloji incelemesi yapılmalıdır, böylece hastalar komplikasyonlar artmadan önce uygun şekilde tedavi edilebilir.

**Anahtar Kelimeler:** Parazit, histopatoloji, doku reaksiyonu



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## INTRODUCTION

The parasite is a living organism that lives in or on another living organism which is known as host. Parasite obtains nourishment and protection from host and consequently causes infections leading to tissue reaction. Tissue reaction causes inflammatory reaction which occurred due to human parasites. Human parasites were classified in few major divisions, including Protozoa, Fungi, Platyhelminthes (cestodes, trematodes), Nematode and Arthropod (insects, spiders, mites, tick, etc.). The common parasitic infection are like amoeba in the intestine causing amoebic colitis (1), filariasis in scrotum (2), *Echinococcus* causing hydatid cyst in liver (3) and Cysticercosis caused by larval cysts of the tapeworm *Taenia solium* (4).

Histomorphological features are helpful in the diagnosis of human and animal diseases of different etiologies. In many cases, parasitic diseases are not properly recognized on routine laboratory investigations. An insufficient diagnosis often leads to wrong or ineffective treatment. On histopathology, these parasites produce tissue responses which provides clue in the identification of parasites and finally reaching at the correct diagnosis, thus histopathological examination of affected organs or tissues facilitates a concise and accurate diagnosis which is helping in planning the precise and correct treatment (1,5).

Histopathology stains like haematoxylin and eosin and periodic acid schiff are not only fruitful in the identification of the parasite but also in the predicting host tissue response (2,6). As per authors knowledge no such study is performed till date so, this study was planned with the objective to know the tissue response against the parasite infection and its comparison in terms of variables like age, sex, type of parasite.

## METHODS

This was a retrospective study, conducted in the department of pathology. All the 26 cases of parasitic infections in human specimens reported in our department from January 2008 to December 2019 were included in this study. All the clinical details like age and sex of patients, and site of lesion along with radiological findings where ever available were noted from the histopathology record register.

All archived H and E stained slides of each case were thoroughly examined for histological identification of the parasite and the various tissue reactions elicited against each parasitic infection. Special stains such as PAS were also performed where ever required to confirm diagnosis, such as in cases of amoebic colitis.

### Statistical Analysis

Statistical analysis was done by percentage.

Ethical clearance was taken from Institutional Ethical Committee of Uttar Pradesh University with ethical clearance no: 228/2018.

Consent of patients were not taken, as we had received tissue for histopathology examination and details were obtained from the patients records.

## RESULTS

In the present study over a period of 12 years there were 26 cases of parasitic lesions identified on histopathological examination. Age range of patients was 5 years to 70 years. Nine patients were

male while 17 were females with M:F ratio of about 1:2. Females were more infected by parasites.

Maximum number of patients were belonging to 11-20 year age group while minimum cases were belonging to 21-30 year age group (Table 1).

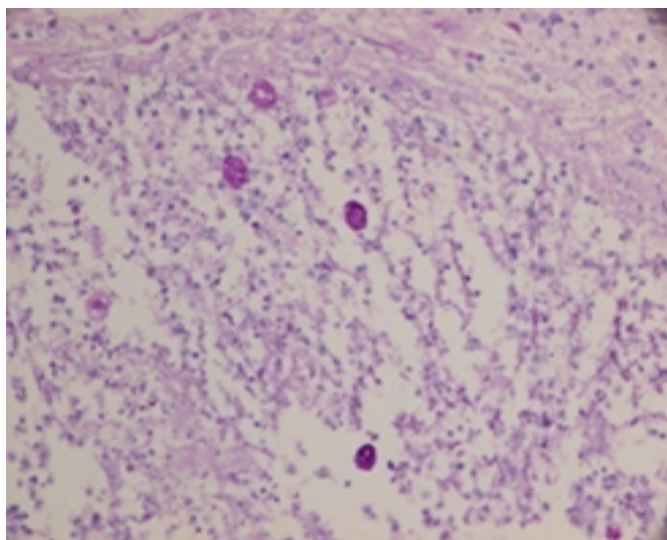
Frequency of various parasitic infections is summarised in (Table 2). Among the 26 cases, maximum cases were of hydatid cyst comprising of 9 cases (34.62%) followed by *Entamoeba histolytica* (23.07%) (Figure 1), *Enterobius vermicularis*

**Table 1.** Table of age distribution

Age group	No. of cases	% of cases
0-10	2	7.69
11-20	9	34.62
21-30	1	3.85
31-40	5	19.23
41-50	3	11.54
51-60	3	11.54
61-70	3	11.54
Total	26	100

**Table 2.** Frequency of various parasitic infection

S. N.	Type of parasitic infestation	No. of cases	% of cases
1	Hydatid cyst	9	34.62
2	<i>Entamoeba histolytica</i>	6	23.07
3	<i>Enterobius vermicularis</i>	4	15.38
4	<i>Ascaris lubricoides</i>	2	7.69
5	Filaria	2	7.69
6	Cysticercosis	2	7.69
7	Highly suspicious of parasitic infection; resolving parasitic infection (Filaria on FNA)	1	3.85
	Total	26	100



**Figure 1.** PAS stained section of *Entamoeba histolytica* in intestine

PAS: Periodic acid schiff



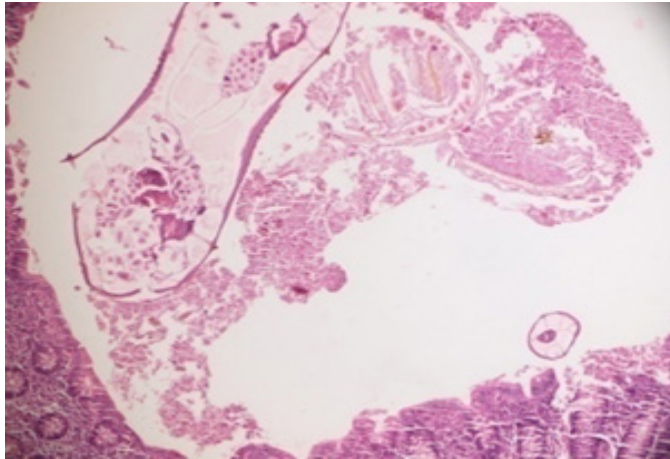
(15.38%) (Figures 2, 3), and (7.69%) *Ascaris lubricoides*, (7.69%), filaria (Figures 4, 5) and cysticercosis (Figure 6) respectively.

There was one case (3.85%) in which no fragment of parasite was seen, but tissue reactions strongly raised the suspicion of parasitic infection. In the same case microfilaria was reported on FNA, but it could not be appreciated on histopathology because of resolving parasitic infection (Table 2).

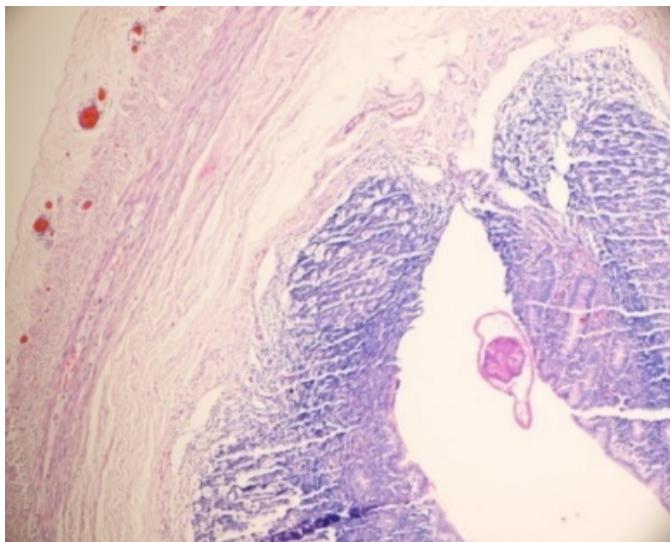
Hydatid cyst was most common parasite reported in this study (34.62%). The peak age for the incidence was 11-56 years followed by others.

## DISCUSSION

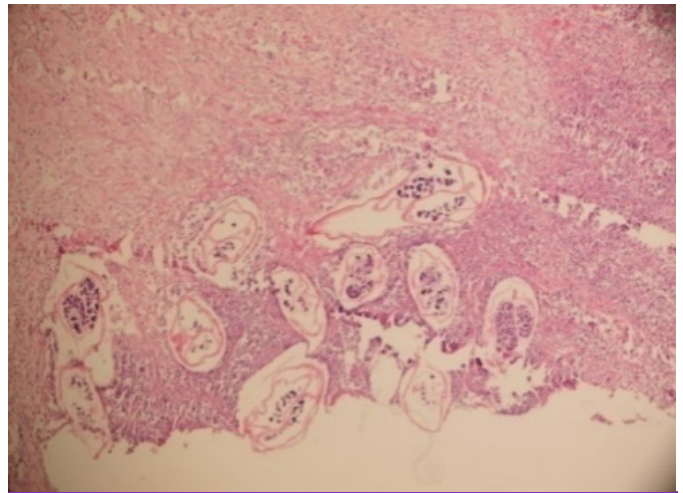
Parasites may infest humans and cause parasitic diseases. In India, Charak Samhita and Sushutra Samhita documented malaria. The Bhrihu Samhita from 1000 BCE had made earliest documentation of amebiasis. The diagnosis of parasitic infection is mandatory to diagnose the disease. The different diagnostic



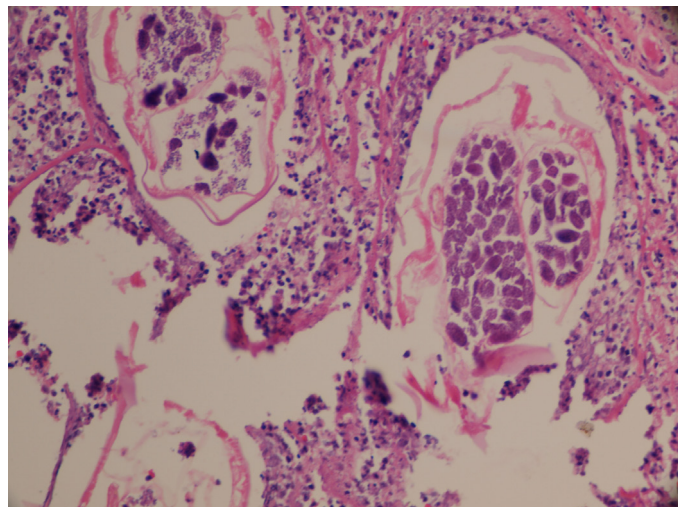
**Figure 2.** H&E stained section of appendix with *Entrobious vermiculus*  
H&E: Hematoxylin and eosin



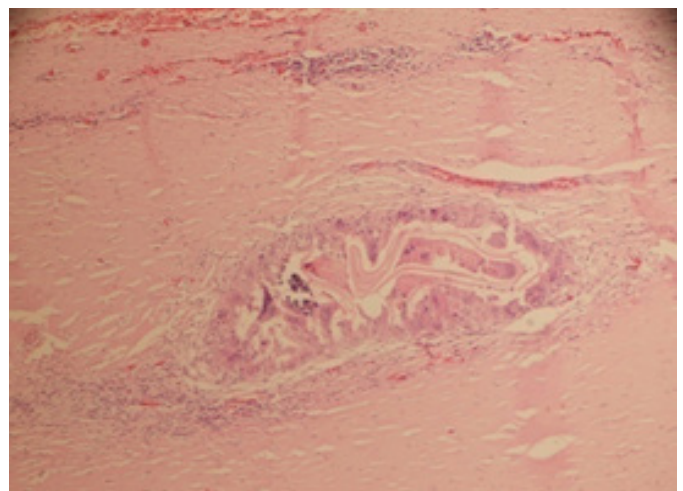
**Figure 3.** PAS stained section of appendix with *Entrobious vermiculus*  
PAS: Periodic acid schiff



**Figure 4.** H&E (4x) stained section of lymph node with microfilaria  
H&E: Hematoxylin and eosin



**Figure 5.** PAS stained section of lymph node with microfilaria  
PAS: Periodic acid schiff



**Figure 6.** H&E stained section of neurocysticercosis cellulose with tissue response  
H&E: Hematoxylin and eosin

tests includes stool examination, endoscopy, blood tests including blood film smearing and serology, radiology investigations and histopathology (7,8). Now a days, PCR is also used for the confirmative diagnosis of parasite and is seen only in higher centres only because it is expensive and requires experience person to manage. Tissue staining with hematoxylin and eosin (H&E) and PAS not only identify parasite but also visualize host tissue reaction (9). So, histopathological examination is the bench mark diagnostic test for identification of various parasitic agents and tissue response.

The government also conducts various policies for the elimination of parasites like filariasis as it causes an important health problem in India (10).

In the present study over a period of 12 years there were 26 cases of parasitic lesions identified on histopathological examination in which parasite was identified in 25 cases and one case there was tissue reactions which strongly raised the suspicion of parasitic infection, as the microfilaria was reported on FNAC in the same patient. Parasite could not visualized on histopathology because of resolving parasitic infection.

Age range of patients was 5 year to 70 year (Table 1) which was comparable with other researchers (9). Most common parasitic infection in our study was hydatid cyst, out of which maximum were located in liver (Table 2). This finding was in concordance with the study done by Rao et al. (11), who reported 72% cases of hydatid cyst in liver.

The difference in incidences of parasitic infection may be because of difference in geographical distribution of various parasitic species.

The peak age range also provide the clue for variant of parasite infection. The youngest patient was seen in peak range of 5-35 years which was reported in ascaris simultaneously the oldest was noted in peak range of 45-70 which was for filaria (Table 3). Age range of the patients diagnosed with hydatid cyst, *Entamoeba histolytica*, and Filaria was in concordant with study done by Manoharan and Sowmya (9), Sabesan et al. (10) and Rayan et al. (12).

As far as the age distribution for *Ascaris lubricoides* and Cysticercosis was reported, it was found lower in comparison to these researchers. This difference could be because of scanty number of parasites cases in their studies.

The parasite commonly encounter in humans are filariasis, ascaris, cysticercosis, amoeba, hydatid cyst and enterobious vermicularis (13-15). The most common location of parasite infection was liver in current study. The site/location of parasitic infection was comparable with other researchers (Table 4). The other researchers reported different sites other than liver this discordance may be due to geographical distribution and due to different parasites harboring at different places.

Tissue response in our study was concordant with the study done by Manoharan and Sowmya (9) (Table 5). In other studies eosinophilia was the most presenting finding for parasite infection but in current study eosinophils were rarely recognized ie, 3 cases out of 26 cases have eosinophil cell in tissue reaction.

In contrast to that here, there was predominance of chronic inflammatory cells infiltration. The reason for the presence of chronic inflammatory cells accumulation might be the presence of persistent parasite leading to chronic immune response (Table 6).

In most cases of hydatid cyst we received only cyst so comment on tissue reaction was not possible. There was only two case of infected hydatid cyst which were found infiltrated by chronic inflammatory cells.

In a case of amoebic colitis initially any amoebic cyst or trophozoite was not appreciated but the mononuclear cell along with eosinophil cells infiltration was so intense which raised suspicion for the parasitic infection. On PAS stain the trophozoites and cyst was well recognized. Similarly Liu et al. (15) applied PAS for the identification of amoebic trophozoite in their study.

PAS staining also enhances the diagnostic efficiency for the identification of parasites. The PAS is a cheaper reagent and the method of PAS staining is equally simple as H&E staining and easily manageable in laboratory. So, it should be applied in

**Table 3.** Comparison of age group in the present study with other studies (9,10,12)

S.N.	Parasitic infestation	Peak age range (years) present study	Age group in other studies
1	Hydatid cyst	11-56	21-58
2	<i>Entamoeba histolytica</i>	22-67	2-65
3	<i>Enterobious vermicularis</i>	9-38	-
4	<i>Ascaris lubricoides</i>	5-35	15-58
5	Filaria	45-70	35-80
6	Cysticercosis	14-17	20-40

**Table 4.** Occurrence of common parasites in various studies

S.N.	Authors	Year of study	Site	Occurrence
1	Manoharan and Sowmya (9)	2016	Genital filariasis, hydatid cyst in liver, soft tissue cysticercosis	Each 22.2%
2	Sabesan et al. (10)	2014	Genital filariasis	72.6%
3	Rao et al. (11)	2012	Hydatid cyst in liver	72%
4	Vora et al. (13)	2008	Soft tissue cysticercosis	88%
5	Dhanabal et al. (14)	2014	Intestinal parasites	<i>Entamoeba coli</i> (26%) and <i>E. histolytica</i> (22%)
6	Present study	2020	Hydatid cyst in liver	34.62%



**Table 5.** Parasitic lesions and their tissue response comparison in the study by Manoharan and Sowmya (9) and present study

S.N.	Parasite/lesion	Tissue response in study by Manoharan and Sowmya (9)	Tissue response in present study
1	Filariasis	Eosinophilic abscess, fibrosis, calcification, lymphoid aggregate with germinal center formation	Necrosis, acute inflammation chronic inflammation [eosinophils and pigment laden histiocytes and no definite parasitic fragment seen in resolving parasitic cysts (microfilaria was seen in FNAC)]
2	<i>Ascaris enteritis</i>	Mucosal ulceration, eosinophilic infiltration, fibrosis, submucosal oedema and congestion	Chronic inflammatory cells infiltration comprising of lymphocytes, plasma cells and histiocytes
3	Cysticercosis	Inflammatory infiltrate, xantho granulomatous reaction.	Chronic inflammatory cells, palisaded epithelioid cells granuloma and giant cell
4	Amoebic colitis	Mucosal ulceration, cytoplasmic vacuolation, congested blood vessels	Mucosal ulceration. Necrotic debris, acute and chronic inflammatory cells infiltration along with eosinophils
5	Hydatid cyst	Mononuclear cell infiltration, fibrosis, hemorrhage, calcification, congested blood vessels.	Mononuclear cells infiltration comprising of lymphocytes, plasma cells, histiocytes and fibroblasts
6	<i>Entrobious vermicularis</i>	No case	Acute and chronic inflammatory cells infiltration

**Table 6.** Percentage of type of tissue reaction in 26 cases

Tissue reaction	No. of cases	Percentage (%)
Acute inflammation	4	15.38%
Chronic inflammation	14	53.85%
Necrosis	3	11.54%
Eosinophils	3	11.54%
Epithelioid granuloma	1	3.85%
Giant cell	1	3.85%

histopathology section in daily routine staining to confirm the parasitic infection.

## CONCLUSION

We emphasize on the application of histopathology along with PAS staining for the diagnosis of parasitic infection which not only reduce the morbidity and mortality but also provide correct way for the management to the infected patients. Among tissue response chronic inflammatory cells infiltration was found more frequent and significant. More studies should be carried out with the same aim and including a more numbers of parasitic infected patients.

### \*Ethics

**Ethics Committee Approval:** Ethical clearance was taken from Institutional Ethical Committee of Uttar Pradesh University with ethical clearance no: 228/2018.

**Informed Consent:** Consent of patients were not taken, as we had received tissue for histopathology examination and details were obtained from the patients records.

### \*Authorship Contributions

Surgical and Medical Practices: M.K., S.D., Concept: M.K., S.D., Design: M.K., S.D., Data Collection or Processing: M.K., Analysis or Interpretation: M.K., S.D., Literature Search: M.K., S.D., Writing: M.K., S.D.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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