Clinical Research
A survey on etiopathological correlation of Krimi (intestinal helminths) and Pandu (anemia)

V. G. Tengse¹, M. S. Baghel², S. N. Vyas³, J. R. Joshi⁴

¹Lecturer, Department of Roga Nidan, Gomantak Ayurveda College, Goa, ²Director, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, ³Ex.Head, Department of Kaya Chikitsa, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, ⁴Consultant Pathologist, Jamnagar, Gujarat, India

Abstract
A survey study was aimed to find etiopathological status of intestinal helminths and also to accomplish its association with clinical condition Pandu. The survey samples included population of five schools and two localities in and around Jamnagar. The study was conducted on 337 subjects, of whom 36.20% cooperated to give stool samples to pathology laboratory; more than half of the samples surveyed were suffering with various parasitic infestations and one-third of the total subjects were found at risk to develop Pandu. Ascariasis patients were found in 71.14%, a potent cause of Pandu. Enterobius vermicularis was found in 19.05%, while Hymenolepis nana in 6.35%. 77.77% were in the age group of 10 to 20 years, 58.73% were male, 93.65% patients were Hindu, 80.95% of the patients had secondary level of education, dominancy of rural habitat was in 77.77%, and 39.68% each were from lower and lower middle class.

Key words: Intestinal helminths, Pandu, Ascariasis, Udara Krimi

Introduction
Health education and awareness is a boon to the society. But still, there is a class of population who are victims of parasitic infestations which is ruining their health. The actual prevalence rate cannot be figured out as some either remain undiagnosed or many do not even bother to report. With the advancement of healthcare and awareness about health issues, it was mandatory to know the present etiopathological status of intestinal Helminths. There are always two sides of a coin, though advances follow, there is still ignorance and poverty causing parasites to damage our lives.

The branch microbiology in Ayurveda is not well established in comparison with the modern science. Kaviraj Gananath Sen in the preface of his book “Siddhanta Nidana” has mentioned the necessity of knowledge of microorganisms to Vaidyas to fulfill objects like: Satya Anaveshanartha (to know the truth), Sankraman Avaarnartha (to check the spread of the diseases), Chikitsa Vishesh Abhyupgamanartha (to plan and find out special and new treatments), and lastly but most important Pradurbhoota Kechan Navin Rogah (to study certain newly occurring diseases).[1] It is the need of the hour to add up in the areas of lacunae mandatory for the propagation of science.

Aims and objectives
Survey aimed at achieving the following two goals:
• To study the incidence of intestinal helminths in the population.
• To establish etiopathological correlation between Udara Krimi and Pandu.

Materials and Methods
The study includes surveyed samples from five schools and two localities in and around Jamnagar. Routine investigations of hematology, macroscopic and microscopic examination of stool were done in Pathology laboratory of I.P.G.T. and R.A. Stool examination for detection of intestinal helminthes or their ova, cystic forms was done by zinc sulfate concentration method[2] [Tables 1 and 2].

Observations: Areas of survey study
The area of the study has been depicted at Figure 1.

General observations
The general observations have been depicted at Figure 2.

Results
The results and observations have been depicted at Tables 1-3.

Ascaris lumbricoides
(a) Macroscopic findings of stool samples show 66.66% had
### Table 1: Details of survey study

| Name of school                                      | Age-group | No. of students surveyed | Date of survey | No. of students with symptoms | Subjects giving samples | Positive report for helminths |
|-----------------------------------------------------|-----------|--------------------------|----------------|-----------------------------|------------------------|------------------------------|
| G. S. Mehta, Vikas Gruha                            | 16-18     | 75                       | 28th Nov 08    | 43                          | 2                      | 2                            |
| Adarsh Nivas, Sadhana Colony                        | 11-14     | 49                       | 6th Dec 08     | 33                          | 28                     | 21                           |
| Saraswati Vidyalaya, Krishnanagar                   | 10-12     | 83                       | 27th Feb 09    | 25                          | 20                     | 09                           |
| Vibhapar, SV Govt School, Bhimvaas                   | 10-12     | 24                       | 17th Jul 09    | 15                          | 13                     | 5                            |
| Sadhana Colony                                      | 10-12     | 48                       | 25th, 27th Jul 09 | 30                      | 27                     | 10                           |
| Maheshwari Nagar                                    | 33        | 27th Nov 09               | 20             | 19                          | 15                     | 12                           |
| Bedi                                                | 25        | 3rd Dec 09                |                | 185                         | 122                    | 63                           |
| Total                                               | 337       |                          |                | 185                         | 122                    | 63                           |

### Table 2: Details of intestinal helminths diagnosed in the survey study

| Helminth                        | School Localities | Total (63) | %  |
|---------------------------------|-------------------|------------|----|
| Ascaris lumbricoides            |                   |            |    |
| Unfertile ova                   | 11                | 13         | 28.88|
| Fertilized ova                  | 25                | 32         | 71.11|
| Total                           | 36                | 45         | 71.43|
| Ancylostoma duodenale           | 1                 | 1          | 1.59 |
| Enterobius vermicularis         | 10                | 12         | 19.05|
| Hymenolepis nana                | 4                 | 4          | 6.35 |
| Trichuris trichiura             | 1                 | 1          | 1.59 |

### Table 3: Symptoms of *Ascaris lumbricoides* in percentage (n = 45)

| Sanjata Krimi Lakshana | Shleshmaja Purishaja |
|------------------------|----------------------|
| Shula (91.11)          | Shula (91.11)        |
| Vivarnata (77.77)      | Vivarnata (77.77)    |
| Bhaktadvesha (68.88)   | Pratishyay (60)      |
| Shwasa (57.77)         | Karshya (53.33)      |
| Gudakandu (86.66)      | Pandu (91.11)        |

Figure 1: Area of survey study
Table 4: Symptoms of *Enterobius vermicularis* in percentage (*n* = 12)

| Sanjata Krimi Lakshana (%) | Shleshmaja (%) | Purishaja (%) |
|---------------------------|----------------|---------------|
| Shula (76.92)             | Shula (76.92)  | Shula (76.92) |
| Vivarnata (69.23)         | Vivarnata (69.23) | Vivarnata (69.23) |
| Bhaktadvesha (53.85)      | Avipaka (76.92) | Gudakandu (84.62) |
| Atisaar (61.54)           | Gudatnishkraman (92.31) | Pandu (84.62) |

Table 5: Symptoms of *Hymenolepis nana* in percentage (*n* = 5)

| Sanjata Krimi | Shleshmaja (%) | Purishaja |
|---------------|----------------|-----------|
| Shula (after meals) 60 | Shula (after meals) 60 | Shula (after meals) 60 |
| Vivarnata (60) | Vivarnata (60) | Vivarnata (60) |
| Atisaar (80) | Pratishyay (100) | Karshya (60) |
|               | Guda Kandu (60) | Pandu (60) |

Table 6: Classical *Nidana sevan* reported by patients of *Udara Krimi* (*n* = 63)

| Vyanyak Nidana | No. of patients | %  |
|---------------|----------------|----|
| Pishtanna sevan (uncooked flour) | 52 | 82.54 |
| Vidal (uncooked cereals) | 44 | 69.84 |
| Shaluk | 26 | 41.26 |
| Pambashaka (unclean) | 49 | 77.77 |
| Dadhi | 25 | 39.68 |
| Guda | 48 | 76.19 |
| Madhura Amla Rasa priya | 50 | 79.34 |
| Malina (Stale food) | 51 | 80.95 |
| Adhyashan | 43 | 68.25 |
| Chalks eating habit | 29 | 46.03 |
| Wet mud eating habit | 42 | 66.66 |
| Diwaswaap | 37 | 58.73 |

Table 7: Causative factors reported by 63 patients of *Krimi Roga*

| Utpadaka Nidana | No. of patients | %  |
|-----------------|----------------|----|
| Feco-oral contamination | 60 | 95.24 |
| Irregular bathing | 57 | 90.45 |
| No brushing | 52 | 82.54 |
| Nail biting | 60 | 95.24 |
| Unclean clothing | 47 | 74.60 |
| Public sanitation | 36 | 57.14 |
| Panipuri (thrice in a week) | 29 | 46.03 |
| Low branded ice candies | 47 | 74.60 |
| Golas (twice in a week) | 18 | 28.57 |

Table 8: Etiological factors found specific to causative organism

| Etiological factors | Straw mala Pravrutti (%) | Ascaris lumbricoides (%) | Enterobius vermicularis (%) |
|---------------------|---------------------------|--------------------------|-----------------------------|
| Ancylostoma duodenale (n = 1) | 100 | Walking barefoot on place particularly common for defecation and water |
| Ascaris lumbricoides (in 15 patients) | 33.33 | Green salads, uncooked vegetables |
| Enterobius vermicularis (in 5 patients) | 41.66 | Infection transmitted through infected family member |

Discussion

On survey methodology

Random sampling method was adopted for the present survey wherein five schools and two localities were selected to find the incidence of intestinal helminths in the population of Jamnagar.

On significant observation

- The age group found maximum in 10 to 20 years: The reason obviously is that the majority portion of survey sample was belonging to high school going age group. A published data also favors above findings that rate of incidence is high in age groups 10 to 20 years, 20 to 30 years and decreases from 31 to 50 years and 51 to 65 years. Also, a study conducted to find incidence of anaemia concludes that severe to moderate type of anaemia is predominant in adolescent age group, i.e., 10 years and 19 years, wherein the stated cause found was worm infestation.

- Maximum were male in gender and Hindu in religion. The study does not bear relevancy with gender and religion. It denotes the dominancy of population in the area of survey.

- Education in maximum was up to secondary level as the majority of sample was from schools hence the findings. With the secondary level education, subjects at least were aware of measures of personal hygiene but still were not practicing.
The dominance of rural habitat with 77.77% reflects improper sanitation, drainage facilities, poor hygiene maintenance, etc., as reasons for infestations.

Occupation showed majority as students followed by one-third of sample as laborer. The sample size was largely from schools hence the findings. Contact with contaminated soil, waste, etc., is also a major source of infection, hence data in this category was felt necessary to note.

Socioeconomic status was lower and lower middle in the study. Socioeconomic status mainly determines quality of food and living standards. The data made to arrive on the reason as may be the deficient nutrients in the diet lowered the immune system making the patients susceptible to many infections.

Causative organism in the study found in maximum patients were *Ascaris lumbricoides* with 71.43%, especially fertilized ova found in 71.11%; followed by infestation of *Enterobius vermicularis* in 19.05%, while *Hymenolepis nana* in 6.35%. Patients of *Ancylostoma duodenale* and *Trichuris trichiura* were each in 1.59%. This shows the endemic status of *A. lumbricoides* in the area of survey.

*A. lumbricoides* is commonest intestinal nematode of human beings and affects more than one billion people worldwide. The feces with fertilized ova is the carrier of infection, whereas feces of unfertilized ova is not infectious.

Utpadaka Nidana is mainly that which imply the probable source of contamination and suggests maintenance of poor personal hygiene which helps parasites to thrive on host.

Maximum reported feco-oral contamination and nail biting habit was found in 95.24%, followed by irregular bathing habits in 90.45%, no regular brushing habits in 82.54%, habit of consumption of low branded ice candies in 74.60% with maintenance of poor personal hygiene, and in 57.14%, there was history of use of public toilet facilities.

Vyanjaka Nidana here in the context means those which create a favorable environment for parasites to grow.

Data obtained from the study illustrate *Pishtanna sevan* in 82.54%, habit of eating stale food in 80.95%, liking toward *Madhura* and *Amla Rasa* in 79.34%, *Guda sevan* in excess quantities in 76.19%, not properly cleaned *Parnashaka* eating habit in 77.77%, habit of eating uncooked or raw grains while cleaning in 69.84%, habit of eating without proper digestion of previously taken meal *Adhyasha* in 68.25%, habit of eating mud particularly from the banks of lakes and of the roots of lotus plants in 66.66%, and habit of *Divwa waapa* in 58.73%.

The potentiating etiological factors are suggestive of the following:

Agni Dushti - Habit of eating stale food in 80.95%, habit of eating uncooked or raw grains while cleaning in 69.84%, habit of eating without proper digestion of previous meal *Adhyasha* in 68.25%, and habit of eating clay particularly from the banks of lakes and of the roots of lotus plants in 66.66%.

Kapha Prakopa - *Pishtanna sevan* in 82.54%, *Madhura* and *Amla Rasa* in 79.34%, use of *Guda* in excess quantities was reported in 76.19%, and habit of *Divwa waapa* in 58.73%.

**Krimi and its signs and symptoms**

*Ascaris lumbricoides* - Data clearly illustrate that four each symptoms of *Shleshmaja* and *Purishaja* were found in percentages above 50%. But the percentages are higher in *Purishaja Krimi lakshanas*. Thus, *A. lumbricoides* produces symptoms of both the *Krimis*, i.e., *Shleshmaja* and *Purishaja*. This confirms the hypothesis that the *Krimis* should be graded as *Udara Krimi*. Above data are suggestive of Agni Dushti and *Aam* formation hampering digestion.

Data also support that *A. lumbricoides* interferes with proper digestion and absorption of food. This can be said on the basis of visible food particles in stool in maximum patients.

The data are also suggestive that maximum numbers of patients, i.e., 76.74% are in mild or “grade 1” anemia, while 2.33% signify severe grade of anemia. This implies *Ascaris* as a potent cause of anemia. The symptoms of *Pandu* were found clinically in 91.11%, which suggest that these patients are at risk to alter the objective parameter if left untreated and if *Nidana Parivarjan* is not practiced.

*Enterobius vermicularis* - Data reveal five *lakshana* of Purishaja variety above 50% and two of *Shleshmaja* variety thus may be considered as of Purishaja variety.

Improper consistency of stool is suggestive of hampered digestion and passage of specific worms is the specific diagnostic feature of a particular helminth which is also mentioned in Purishaja Krimi lakshana as *Gudat Nishkraman*. Sushruta has mentioned a characteristic feature of Purishaja Krimi as those which travel down. The data suggest values of hemoglobin percentage within normal range and is not suggestive of anemia, which specifies clearly that the patients of *E. vermicularis* are least causative for the anemia.

*Hymenolepis nana* - *Purishaja Krimi lakshana* are found maximum, so may be considered as a variety of Purishaja Krimi.

Clinical features according to modern parasitology include diarrhea; the study also supports the above as in maximum patients, consistency of stool was *drava* with increased frequency.
Probable Samprapti (pathogenesis)
Fills the channels by material which tissue cannot assimilate causing Bala, Varna, Agni Nasha; hampering nutrition of the host leading to Udara Krimi as etiopathological cause of Pandu [Figure 3].

Conclusion
• Normal values of hemoglobin concentration were noted.

• Etiological factors of Pandu potentiated by Utpadak Nidana of Krimi follows an intermediate Avipaktva state giving rise to clinical condition Pandu due to Udara Krimi.

References
1. Baghel MS. Monograph article on Micro organisms and Ayurveda, Gujarat Ayurved University press, Jamnagar, 1989. p. 85.
2. Karyakarte Rajesh and Damale Ajit, Medical Parasitology, Arunaben Sen Books and Allied (P) ltd, Chintamoni Das lane, Kolkata, January 2003, p. 215.
3. Oluwafemi O. Oguntibeju: Parasitic infestation and Anemia : The prevalence in a rural Hospital Setting, Journal of Indian Academy of clinical medicine Vol-4, No.3, July-Sept 2003. (www. hindu.com/2007 Nov14th accessed on 25/1/08).
4. P. Chakraborty, Textbook of Medical Parasitology, New central book agency (P) Ltd, Kolkata, 2nd edition, January 2005. p. 146.
5. Personal conversation with Dr. J. R. Joshi on 09/09/09 at 10:45am.
6. Agnivesh's Charak Samhita, edited by Vd Jadavji Trikamji Acharya. Charak Chikistasthana 15/52 Varanasi: Chaukhamba Surabharti Prakashan; 2005. p. 57.
7. Rajesh K, Ajit D, Medical Parasitology, Arunaben Sen Books and Allied (P) ltd, Kolkata, January 2003. p. 148.
8. Sushruta, Sushruta Samhita, Utara tancra, krimi pratisheedha adhyaya, 54/9, edited by Vd Jadavji Trikamji Acharya, 7th edition, Chaukhamba Orientalia, Varanasi, 2002. p. 773.
9. Rajesh K, Ajit D, Medical Parasitology, Arunaben Sen Books and Allied (P) ltd, Kolkata, January 2003. p. 122.
हिन्दी सारांश

कृमि और पाण्डुरोग के बीच सम्बन्ध का अध्ययन

वैश्वी टैनासे, एम. एस. वचेल, एम. एन. व्यास, जे. आर. जोशी

प्रस्तुत सर्वेक्षण शोध का मुख्य लक्ष्य कृमि और पाण्डुरोग के बीच सम्बन्ध को जानने हेतु किया गया था। ये सर्वेक्षण नवम्बर 2008 से दिसंबर 2009 के समय में जामनगर शहर के पांच स्कूल और दो जंगलों में किया गया था। कुल 122 लोगों की जांच कराई गई। सेम्प्ल दिये गए। पत्रि प्रतिशत से ज्यादा संख्या कृमि रोग से पीड़ित पायी गई। अर्सेंरिस त्युम्बिन्काईज़स बहुतांश में पाया गया और पाण्डु का एक मुख्य कारक भी स्थापित हुआ। अन्य कृमि अंडरिओबियस वर्मिकूलेश्वरिस 19.05% और एच नाना 6.35%पाये गये। इससे यह कहा जा सकता है कि कृमि रोग से पीड़ित होने से व्यक्ति को पाण्डुरोग होने की संभावना बढ़ती है। इस शोध के अनुसार कृमि और पाण्डुरोग के बीच निदानार्थकर रूप परस्पर संबंध प्रस्थापित होता है।

Author Help: Reference checking facility

The manuscript system (www.journalonweb.com) allows the authors to check and verify the accuracy and style of references. The tool checks the references with PubMed as per a predefined style. Authors are encouraged to use this facility, before submitting articles to the journal.

- The style as well as bibliographic elements should be 100% accurate, to help get the references verified from the system. Even a single spelling error or addition of issue number/month of publication will lead to an error when verifying the reference.
- Example of a correct style
  Sheahan P, O’leary G, Lee G, Fitzgibbon J. Cystic cervical metastases: Incidence and diagnosis using fine needle aspiration biopsy. Otolaryngol Head Neck Surg 2002;127:294-8.
- Only the references from journals indexed in PubMed will be checked.
- Enter each reference in new line, without a serial number.
- Add up to a maximum of 15 references at a time.
- If the reference is correct for its bibliographic elements and punctuations, it will be shown as CORRECT and a link to the correct article in PubMed will be given.
- If any of the bibliographic elements are missing, incorrect or extra (such as issue number), it will be shown as INCORRECT and link to possible articles in PubMed will be given.